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No. 1.—TRICHODINA PEDICULUS AND A NEW CLOSELY RELATED SPECIES.[1]

BY JOHN F. FULTON, JR.

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Introduction.

Trichodina pediculus has long been a zoölogical curiosity, and was among the first of the unicellular forms to engage the attention of the protozoölogist. However, on account of its extraordinary complexity, many of the earlier investigators were loath to

[1] Contributions from the Zoölogical Laboratory of the Museum of Comparative Zoölogy at Harvard College.

acknowledge its unicellular nature. It is interesting also to recall that, because of their association with Hydra, Professor Louis Agassiz as late as 1850 regarded the parasitic *Trichodinae* as representing a medusoid stage in the life history of the forms on which they lived, and Davaine in 1854 (p. 170–172) thought it probable they formed one of the links in the alternation of generations of a higher animal, and even suggested that they might perhaps be found to be a transitional stage of some one of the Entozoa of batrachians.

Historical.—Trichodina pediculus was probably first seen by Leeuwenhoek in 1703. In the Philosophical Transactions of the Royal Society of London for that year (p. 1308) appears a letter from Leeuwenhoek, in which he describes "some animalcula" associated with "green weeds growing in water." After describing an animal (clearly a *Hydra*) which "had brought forth two young ones," he remarks that she "had her body laden with another sort of little creatures, whose shape was flat beneath and round above . . . this last sort were above a thousand times less than the others [*Hydra*] whom they crawl'd upon, and hinder'd to go." It is probable from this that the "little creatures" of which he speaks could have been none other than *Trichodina pediculus*. Some years later, Henry Baker (1743, p. 77 and Pl. 7, fig. 7, p. 72) figured and described certain "animalcules" from "Hay-water" in their contracted and expanded forms, and it is possible that these, too, are representations of *T. pediculus*. Figures also appear in Müller's Animalcula Infusoria (1786, Pl. 11, figs. 15–17) which suggest the form under consideration, and were called by him (p. 84) *Cyclidium pediculus*. The species, however, was first described in full by Ehrenberg (1838, p. 266), and since the name *Cyclidium* was preoccupied, having been used by Hill in 1752 for a genus of holotrichous infusorians, he employed the generic name *Trichodina*, which he had established in 1830 (Ehrenberg, 1830, p. 41). A little later it was given the name of *Urceolaria stellina* (Dujardin, 1841, p. 527); but *T. pediculus* has persisted and is the name by which the form is now designated.

The classic habitat of *T. pediculus* is the cuticular surface of *Hydra fusca* and *H. viridis*. A form probably identical with *T. pediculus* also infests the branchial appendages of certain am-

phibians. Kent (1880–82, p. 648) has observed them on the gill filaments of the larvae of *Triturus* (formerly *Triton*) *cristatus*, and Wright (1880) on the gills of *Necturus;* the latter author finds in addition that they inhabit the urinary bladder. It is also possible that Vulpian (1857) may have seen *T. pediculus* in the branchial cavity of frog tadpoles.

In the present paper it is proposed to deal first, with the *Trichodina pediculus* found parasitic upon the gills of *Necturus maculosus*, — considering especially the singularly interesting series of morphological changes which occur as a result of reproduction, — and, secondly, with a new form, hitherto unnamed and imperfectly described, which is closely related to *T. pediculus*. Specimens of the latter were found in great abundance in the urinary bladder of a toad. The writer discovered the *Trichodina* on the gills of *Necturus* incidentally somewhat over two years ago, while preparing histological specimens of *Necturus* blood; the forms from the urinary bladder also were found quite by accident.

For assistance in studying intricate morphological details of *Trichodina*, and for his constant encouragement, I am most deeply indebted to Dr. E. L. Mark; I wish also to thank Mr. E. E. Fewkes for assisting me in taking the photomicrographs.

Systematic. — Inasmuch as the classification of the family of the Urceolariidae, to which *Trichodina* belongs, is in a very confused state, it seems worth while to discuss the taxonomy rather more fully, perhaps, than the limited scope of the paper would seem to warrant. The more so, as the only classification of this family which appears to the writer as satisfactory, is to be found in a Swedish paper by Wallengren (1897[b]), the contents of which apparently are not widely known among English-speaking protozoölogists. The writer is much indebted to Mr. Sven A. F. Melander, and to Mr. E. F. B. Fries for assisting in the translation of Wallengren's paper.

The animals of the order Peritricha, to which the genus *Trichodina* belongs, are characterized by an unequal distribution of cilia over the body. Delage et Hérouard (1896, p. 478) emphasized the fact, previously noted by Bütschli, that the adoral cilia of some forms in this order describe a left-handed spiral, others a right-handed spiral. This led them to divide the Peri-

tricha into two suborders: the *Scaiotricha* (Péritrichides sénestres) and the *Dexiotricha* (Péritrichides dextres). Though this distinction has not been recognized by all protozoölogists (Doflein), it appears to the writer as being of great practical importance, since it facilitates the identification of many peritrichous infusorians, serving, for example, as a most useful means of distinguishing from each other such perplexing forms as the Licnophorae and *Urceolaria mitra*, the Licnophorae being scaiotrichous and *U. mitra* dexiotrichous.

All of the *Trichodinae* belong to a dexiotrichous family, the Urceolariidae. It is largely a matter of personal preference whether one considers the Urceolariidae a subfamily of the Vorticellidae (in that case being known as the Urceolariinae—Minchin, 1912, p. 440; Doflein, 1916, p. 1142; also 1911, p. 986), or as a separate family. Inasmuch as the Urceolariidae differ in many fundamental ways from the Vorticellidae, the writer has chosen to consider them as a separate family, thus following Kent (1880–82, p. 645) and Wallengren (1897[b]). The Urceolariidae thus appear as the *third* family in the order Peritricha, the *first* in the suborder Dexiotricha.

Concerning the genera within the family Urceolariidae itself, there has been some little dispute. Fabre-Domergue (1888) made a comprehensive study of this family and attempted to establish a large number of genera, most of which were ignored by Bütschli (1887–89, p. 1758). However, the matter was afterwards investigated with great thoroughness and completeness by Wallengren (1897[b]), and though due consideration was given to Fabre-Domergue's new genera, few of them were recognized. At present, therefore, the family Urceolariidae possesses three genera: *Urceolaria, Cyclochaeta* and *Trichodina*. The chief features of the family and its genera may be described as follows:

Family Urceolariidae Stein

Animalcules free-swimming or temporarily adherent, hour-glass or discoidal in shape; oral (peristomal) end roughly circular, bordered by a nearly flat, spiral ciliary wreath (adoral spiral), the right end of which descends into the vestibule; the oral apparatus closely resembles that of the Vorticellidae, with vestibulum and longer or shorter pharangeal passage; aboral end circular, acetabuliform, with complete circle of marginal locomotor cilia or membranellae; outside base of cilia usually a velum; inside, an annular radially striate mem-

brane ("Ringband"), strengthened centrally by a smooth or denticulate horny ring; found as both ecto- and endo-parasites, and as commensals.

The following arrangement of genera and species is substantially the same as that of Wallengren (1897b).[1]

(1) Genus Urceolaria Stein (*Leiotrocha* Fab.-Dom., *Trichodina* Bütsch. p.p.)

Forms with more or less obliquely placed peristome; horny ring of sucking disk without hooks; adoral spiral of cilia terminal. Row of cirri slightly oral to ciliary ring of sucking disk.

Species recognized: *U. mitra* (v. Sieb.); *U. patellae* Cuénot (= *T. patellae*); *U. scrpularum* Fab.-Dom.

(2) Genus Cyclochaeta Jackson (*Cyclocyrrha* Fab.-Dom.)

Peristome parallel to sucking disk, which has a row of cirri; horny ring with hooks.

Species recognized: *C. spongillae* Jacks.; *C. synaptae* Cuénot (?).; *C. ophiothricis* Fab.-Dom.; *C. scorpenae* Fab.-Dom. (?); *C. domergueii* Wallengren.

(3) Genus Trichodina Ehrenberg. (*Anhymenia* Fab.-Dom. p.p.)

Adoral spiral of cilia not terminal; horny ring of sucking disk with hooks; existence of cirri questionable.

Species recognized: *T. pediculus* (Müller) Ehrb.; *T. urinicola*, n. sp.; *T. steinii* Clap. et Lach.

Before proceeding to the genus *Trichodina*, a word must be said concerning the genus *Urceolaria* and the forms related to it. *Urceolaria mitra* (in the older literature *T. mitra*) was first described by von Siebold (1848, p. 12), who found it on fresh-water planarians. Owing to its striking resemblance to *Licnophora* and to *Trichodinopsis*, *U. mitra* has frequently been confused with these forms. However, the exhaustive investigations of Wallengren (*U. mitra*), Stevens (1903, *Licnophora*), and Cépède et Willem (1911, *Trichodinopsis*) have cleared away the discrepancies of the earlier investigators, and it is now possible to describe the structure of these genera with great accuracy. The posterior sucking disk — the structure which first strikes the eye — is, in a general way, very similar in the three forms. In the *Licnophorae*, however, it is slightly smaller and without either horny ring or ring band; also the adoral cilia, as has already been noted, describe a left-hand spiral. The sucking disks of *U. mitra* and *Trichodinopsis* are scarcely distinguishable from each other;

[1] The place of the Urceolariidae in phylogeny is discussed by Calkins (1901, p. 202–204), on the basis of Bütschli's theory; see also Fabre-Domergue (1888, p. 223–224) and Fauré-Fremiet (1905, p. 221).

both are concave, and possess a ring of non-denticulate horny material, and the arrangement of motor cilia is much alike in the two genera. But *Trichodinopsis* has cilia over the entire body, otherwise it should undoubtedly be placed in *Urceolaria*. Indeed, it is keenly to be regretted that the Trichodinopsidae (Kent, 1880–82, vol. 2, p. 614) should have to find their position in a separate order (Heterotricha), far removed from *Urceolaria*, to which obviously they are so closely related, particularly in the light of the investigations of Cépède et Willem. However, the distribution of cilia is undoubtedly the only satisfactory basis for the classification of Infusoria, and it is unwise to make exceptions. Consequently it is fortunate that *Trichodinopis paradoxa* [1] possesses a name which is suggestive of the fact that it is perhaps more closely related morphologically to *Urceolaria* than are the *Trichodinae* within the same family.

Cyclochaeta requires no further consideration, inasmuch as it is readily to be distinguished from *Trichodina* by the presence of a circle of large motor cirri parallel to the margin of the sucking disk, and a little nearer the peristome.

Trichodina pediculus (Müller) Ehrb.

Habitat. — For many years the only known habitat of *T. pediculus* was the body of fresh-water hydras. The *Trichodinaae* from this source were first thoroughly investigated and described in an admirable memoir by James-Clark (1866). Later, as has already been noted, *Trichodinae* were found on *Necturus* and the larvae of *Triturus*, and they were believed to be identical with the forms from *Hydra*. In addition to this apparent morphological similarity, Rosseter (1886) has adduced further evidence for their identity by transferring the *Trichodinae* from the larvae of *Triturus* to *Hydra;* he found that they crawled over the body of the polyp quite as the forms normally there (see below, p. 17). The writer performed the same experiment (before knowing of Rosseter's work) with the *Trichodina* of *Necturus*, and achieved the same result. There can be little doubt, therefore, that the *Trichodinae* from *Necturus* are identical with *T. pediculus* of *Hydra*.

[1] See also the papers of Issel (1906), Schneider (1878) and Fauré-Fremiet (1909).

Structure. — It is not so clear, however, that the *T. pediculus* upon which Wallengren worked is identical with the forms from *Hydra* and *Necturus*. He says (1897[a], p. 56) that he had not had opportunity to compare his *Trichodina*, which came from certain fresh-water fish, with the species from *Hydra*. There would be little reason to doubt that Wallengren's *T. pediculus* is identical with the *Trichodina* parasitic on *Hydra*, were it not for the fact that he described cirri on his form similar to those which exist in the Cyclochaetae.[1] In my own preparations, I have found no evidence whatsoever for the existence of cirri either in the *T. pediculus* from *Necturus* or in the new species which I am about to describe. Moreover, there are, according to Wallengren (1897[b]), no cirri on *T. steinii*. In other details his *T. pediculus* agrees entirely with the species I have studied.

Before the changes which occur during reproduction are recounted, a short description of the posterior end — the sucking disk — must be given.

The edge of the adhesive disk is composed of a non-granular, attenuated membrane-like structure (Pl. 1, fig. 2, *vel.*), to which James-Clark (1866, p. 122) gave the name *velum*.[2] Wallengren has laid great emphasis upon the fact that the velum is marked by very fine radial striations — three or four striations to one rib of the ring band ("Ringband"), which lies nearer the center of the disk. A suggestion of this radial striation is to be seen in the upper one of the two individuals shown in Plate 2, figure 8. Near the base of the velum and on its aboral side, lies the line of attachment (Fig. 7, *ba. cil.*) of the locomotor apparatus of the animal (*cf.* FIGURE *A*, *cil.*), which Stein took for a crown of cilia and von Siebold (1850, p. 361–362) for an undulating membrane,

[1] Wallengren himself expressed (1879[a], p. 56) some uncertainty as to the identity of the *Trichodina* from *Hydra* with the form (from fishes) which he studied, for the reason that his animals were certainly not clothed with the fine bristles ("excessively minute, short cilia," James-Clark, 1866, p. 126) which were claimed by James-Clark to beset the surface of *T. pediculus*. However, the presence of such bristle-like cilia has not been confirmed by subsequent writers on the species.

[2] Fabre-Domergue (1888, p. 249) erroneously asserted the absence of a velum in several Urceolariidae and for such forms established the genus *Anhymenia*. This error has been corrected by Wallengren (1897[b], p. 46), who has thus done away with the genus *Anhymenia*.

similar to the membrane found on the spermatozoa of amphibians. However, Wallengren (1897[a], p. 58; 1897[b], p. 19) has shown that in *T. steinii* it is neither cilia nor a membrane, but a wreath of membranellae, — each membranella springing diagonally from its ring of origin.

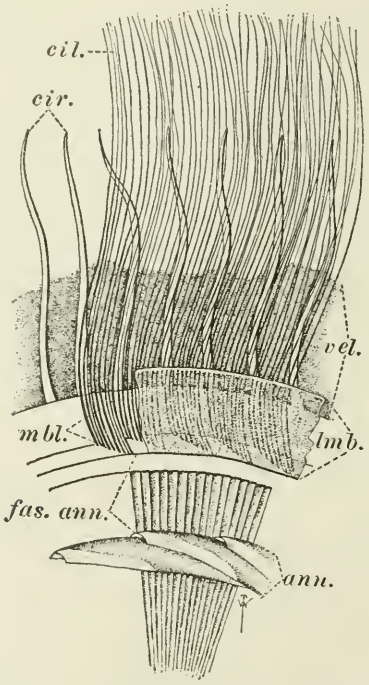

FIGURE A.—Sector from the sucking disk of *Urceolaria mitra*, seen from the aboral (or attaching) surface. Copied from Wallengren (1879[b], Pl. 2, Fig. 9).

ann., ring, without hooks or rays; *cil.*, cilia; *cir.*, cirri; *fas. ann.*, ring band; *lmb.*, border ("Saum"); *mbl.*, membranella; *vel.*, velum.

From the present investigation it is clear to me that a similar structural condition is met with in *T. pediculus*, and in addition, as Wallengren also noted, each membranella is itself striated longitudinally so as to give it the appearance of being composed of five or six cilia fused together side by side. Within the wreath of cilia is the broad striated ring band (Pl. 1, fig. 2, *fas. ann.*),

exhibiting very uniform radiating ribs of a horny material, which apparently lends great firmness to the annulus. The ribs are united together at their outer margin. In addition to the main ribs there are lesser ones, which appear at deep focus and make the total number of radiations in the ring band twice as great (Pl. 1, figs. 1, 6).[1] The ring band is further strengthened by a denticulate ring, also of horny material, which lies upon its aboral surface. It is this ring which is responsible for the beautiful symmetry which has for so long attracted curious attention to *Trichodina*. Kent (1880–82, vol. 2, p. 648) makes the interesting observation that "taken in its entirety, the complex adhesive apparatus of *Trichodina*, with its horny ring and denticles, would seem to find its nearest parallel in the adherent organs or acetabula of the Cephalopoda, which are likewise commonly strengthened by a correspondingly striated, and for the most part denticulate, horny annulus. The structure, as reproduced, or more correctly pretypified, in this minute animalcule is, however, the more remarkable as being the product of a unicellular organism." The horny denticles of which the ring is made, are in reality cornucopia-like structures, which fit one into the other; each denticle possesses two projections, one, a "hook" (*un.*), which extends centrifugally, or outward, the other a "ray" (*r.*) pointing radially inward. These structural conditions can readily be made out in Plate 1, figures 3 and 4 (see also explanation of Fig. 1).

In all the Urceolariidae having a denticulate ring the "hooks" all have the same direction. It is suggested that this direction may be correlated with the direction in which the animal rotates during its free-swimming locomotion.

As to the chemical composition of the denticulate ring, little or nothing is known. From its appearance, one might be tempted to regard it as a chitinous structure, yet the writer has observed the actual dissolution of the horny ring while it was under

[1] Both James-Clark (1866, p. 123) and Wallengren (1897[a], p. 58, Fig. 2) make the finer striations about three times as numerous as the coarser ones, and James-Clark made the mistake of placing them on the aboral side of the coarser ones, whereas Wallengren found that they were on the oral face, and that they were continued outward beyond the "Ringband" and even beyond the base of the circle of cilia.

observation in fresh-water. Also weak acids (acetic) or alkalies disintegrate it immediately, and this shows fairly conclusively that it is not related in any way to chitin. For the present, therefore, one can do no better than to agree with Fabre-Domergue (1888, p. 234) and consider "la capsule striée et l'anneau de soutien des Urcéolaires comme des organes résultant simplement d'une condensation de l'ectoplasma." The extreme difficulty with which the ring is stained also bears out this conclusion (see below, p. 14–15).

The peristome of *T. pediculus* has been described in great detail by many writers, and since, too, it is similar in many ways to the peristome of the new species which is described below (p. 18), it is unnecessary to deal with it here.

Reproduction. — The extraordinary morphological changes which *T. pediculus* undergoes during and after reproduction by division is, I believe, quite unparalleled in any of the other Protozoa. While examining a slide of stained *Trichodinae*, several specimens were found (such as are shown in Pl. 2, fig. 7) which did not possess the normal ring of 24 or 26 denticulate processes, but displayed, instead, two rings, one of which (the inner) had but thirteen denticles, the outer ring showing 24 or 26 imbricated pieces. In other similar specimens the outer ring was hardly more than a narrow band (Pl. 1, fig. 3, *anń.*), and further examination revealed the fact that among the two-ringed individuals there were apparently many developmental stages both of the inner and outer ring (compare the inner ring of Pl. 1, fig. 3 with that in Pl. 2, fig. 7). How is such a condition to be explained?

Stein (1859–1883, Abth. 2, p. 128) was the first to describe the process of division in *Trichodina*. He also observed (in 1864) two-ringed specimens, and gave to them the name of *Trichodina diplodiscus* (sometimes misspelled *digitodiscus*).[1] It seemed clear to the writer, on finding a large number of such specimens with their rings in all stages of development, that these were not

[1] It seems rather strange that Stein, after accurately noting that division resulted in a halving of the number (28–32 reduced to 14–16) of teeth (hooks), should have failed to connect individuals having two rings — the inner one of which had only 12–14 teeth — with the process of reproduction, and should have stated — apparently without direct evidence — that the restoration to the normal number was effected by a gradual interpolation of new teeth.

separate species, but simply specimens of *T. pediculus* which were undergoing some peculiar change, possibly associated with reproduction. Subsequent study of the literature showed that this was not a new idea; Fabre-Domergue (p. 233) was himself somewhat skeptical of Stein's new species, and suspected that it represented a phase in the reproduction of *Trichodina*. He remarks: "Le fait que Stein aurait observé sur une Hydre tous les individus présentant le même caractère ne peut être considéré comme une preuve suffisante de l'indépendance de son espèce, car j'ai pu constater que la multiplication des Trichodinides peut être en quelque sorte épidémique, et qu' à un moment donné, tous les individus parasites d'un même animal présentent souvent tous la même phase de division." Fabre-Domergue did not commit himself further, as he was unable to find intermediate stages; nevertheless he was certainly correct as far as he went. Also his observation that reproduction seems to occur in epidemics is particularly interesting, for the writer has examined somewhat over a hundred *Necturi* and has encountered only two cases in which double-ringed individuals could be found, but in these two instances they were plentiful. In one instance the process of division was watched in the living animal, unfortunately, however, not to completion. The ring of hooks divided by the formation of two clefts, opposite each other, in the velum and ring band, which passed inward. The sucking disk was thus divided into halves, and it was clear from this observation that each of the daughter cells received but twelve (or thirteen) teeth.

Whether this halving of the number of teeth in *Trichodina* had been observed by the early investigators (*i.e.* before Stein), is not altogether clear. In Bütschli's treatise (1887–89, Taf. 73, Fig. 3b) a figure appears showing the sucking disk of *Trichodina* sp., from the gills of *Gadus lota*, in division. There is no mention of the figure in the text (*cf.* text, p. 1582), but a note in the explanation of the plate refers the figure to the "uned. Tafeln" of [N.] Lieberkühn, 1855. Hence this investigator probably deserves the credit for having been the first to observe the halving of the number of teeth (apparently from 22 to 11) in *Trichodina*. The only other writer who deals with the reproduction of the Urceolariidae is Wallengren (1897[a], 1897[b]). He has observed

and described in detail the process of the halving of the number of denticles in the ring, as a result of reproduction, in *Cyclochaeta domergueii*, in *Trichodina steinii* (1897[b]), and in his representatives of *Trichodina pediculus*. He notes also that a line marking the fundament of the new ring makes its appearance shortly before division (see his text-figures 3 and 4, 1897[a], p. 60).

In specimens which recently have divided, the twelve denticles, being more widely separated, in virtue of their smaller number, are to be seen with great clearness. Before division the hooks and rays occupy almost the entire area of the ring band, making it difficult to see the radial striation of that structure, whereas in an individual newly divided, the hooks and rays (especially the former) cover only the inner one-half or two-thirds of the ring band. It is in the outer third of the ring band that the new ring of denticles makes its appearance. At first sight the new ring appears merely as a continuous circular structure, but closer examination reveals the fact that it is composed of a series of rods, twenty-four in number, overlapping each other in such a way as to give the outer margin of the ring a serrated appearance. When fully formed it might be compared with a ring, some eight inches in diameter, made of twenty-four overlapping wooden matches, each two and a quarter inches in length. If, now, one imagines that the inner end of each match in the ring gradually sends a process (the ray) radially inward at right angles to itself, and that the outer end grows out into a flattened projection having the contour of a golfer's "putter," — the body of the match remaining as the connecting link between the two, — the appearance of each denticle, and of the denticulate ring as a whole, becomes at once clear. Concomitantly with the growth of the outer ring, the denticles of the inner ring become absorbed. Pairs of adjacent rays of the outer denticles push themselves between the successive hooks of the inner denticles (Pl. 2, fig. 7). The hooks and rays of the inner ring finally disappear, leaving only the bodies of the denticles, which are still arranged like twelve matches overlapping each other in a ring having a diameter of about four inches. Finally the bodies themselves lose their identity; thus the old ring has disappeared, and a normal sucking disk results.

The writer feels justified in redescribing the division of the

"Ring" in *Trichodina*, since Wallengren, whose chief work was published in Swedish, is the only one who has ever done it with any thoroughness. Moreover, since the division of this animal is attended by so many unusual transformations, the corroboration of Wallengren's work does not seem out of place. Much more important, however, is the author's desire to direct attention to Wallengren's painstaking investigations, which seem to have escaped the notice of English-speaking protozoölogists.[1]

Nuclear condition. — The nucleus of the adult *T. pediculus* is horseshoe-shaped, not beaded, as James-Clark maintained, but highly granular; in fact, the granules give to the nucleus a most irregular appearance, but one which could not possibly be described as beaded. The nucleus can be seen in Plate 1, figures 1 and 2, being, in mounting, slightly displaced downward (on the Plate) from the sucking disk. The nucleus of individuals which recently have divided is short and thick, and describes hardly more than a half circle. This may be seen in Figure 3. In Figure 5, an attempt has been made to bring out the nucleus more clearly by using green light as a source of illumination during the photographing. The nucleus is, indeed, darker in this print, but the interpolation of the green screen so cut down the light as to render the details less distinct than in the other figures.

The micronucleus occupies an eccentric position imbedded in one side of the body of the macronucleus, usually at that end of the macronucleus which is nearest to the vestibular opening. In Figures 1 and 2 the micronucleus may be seen bulging from the surface of the macronucleus at a point nearly corresponding with nine on the clock.

The nuclear changes attendant upon division in *T. pediculus* have not been observed. However, they have been briefly described for the related form *Trichodinopsis* by Cépède et Willem (1911). Here the macronucleus divided apparently by a simple process of elongation and constriction, being drawn out into the form of a coin-purse, or figure 8, without evidence of mitotic complication; the changes in the micronucleus are not described.

[1] Neither Calkins (1901, 1909), nor Minchin (1912) refers to either of Wallengren's papers (1897[a] and 1897[b]).

The behavior of the micronucleus and the macronucleus of *Urceolaria patellae* (= *T. patellae* Cuénot, see below p. 20) during both division and conjugation has, however, been followed with great care by Caullery et Mesnil (1915). In division the macronucleus first concentrates itself, then is drawn out into the dumbbell form with filamentous structure running in the direction of the elongation, and finally divides by a process of amitosis, while the micronucleus becomes formed into a spindle and divides by a "sorte de mitose imparfaite."

The Urceolariidae are commonly regarded as representing a stage intermediate between the free-swimming infusorians and such fixed forms as the Vorticellidae; consequently it is of extreme interest to learn, from Caullery et Mesnil, that the process of conjugation in the Urceolariide is anisogamous, representing clearly a stage between the complete isogamy of the free-swimming forms and the highly specialized anisogamy of the Vorticellidae. The only recognizable difference between the two kinds of gametes of *U. patellae* is one of size, there being no morphological modification. Immediately before conjugation the macronucleus of both conjugants disseminates itself throughout the cytoplasm in the form of small vesicles. The microgamete then attaches itself to the side of the macrogamete by means of its sucking disk, and each micronucleus forms itself into a spindle. The spindle of the microgamete probably passes *into* the macrogamete, leaving its own cell body to disintegrate. The stages which follow closely resemble the corresponding stages in the Vorticellidae, and need not be recounted.

Technique. — The *Trichodinae* which served for the present study were discovered in a slide of blood from *Necturus* stained by means of Giemsa's azur-eosin process.[1] The blood corpuscles on the slide in question were poorly stained, but the *Trichodinae* were in an exceptionally fine state of differentiation. The

[1] Fix for twelve hours in a mixture of 2 volumes saturated aqueous sublimate solution with 1 volume of absolute alcohol. Wash with weak KI solution to which have been added 100 volumes of water and 2 volumes of Lugol solution. Wash, and treat with 0.5 % sodium thiosulphate. Wash, and stain for one hour in *fresh* azur-eosin mixture for about one hour. Dehydrate with the following mixtures of acetone and xylol: 95:5%, 70:30%, 30:70%, and finally pure xylol.

nucleus stained a deep azure blue, while the minute structures of the sucking disk had become a rich pink, and this it was which so greatly facilitated their photomicrographic reproduction. Though the results in this case were excellent, the writer is somewhat loath to recommend the Giemsa process as a stain for *Trichodina*, since in ten subsequent trials he was never able to obtain a degree of differentiation as satisfactory as that of the first slide. Some success was also had using (after Wallengren, 1897[a]) acid fuchsin on unfixed specimens. This also helps to demonstrate the denticulate ring.

Trichodina urinicola, n. sp.

Trichodina sp., Rosseter, 1886.

Habitat. — Some time after observing *T. pediculus* on the gills of *Necturus*, the writer, in February, found an urceolarian in enormous numbers in the urinary bladder of a large moribund toad (*Bufo* sp.) common in Massachusetts. The parasites were prepared on slides in various ways, but as none of the stains was wholly satisfactory, the writer sought for additional specimens of the parasite on the following day. However, of the many frogs, toads, and necturi which had been in the aquarium with the moribund toad not one appeared to be infected. Consequently, this part of the present study is based on the forms found in a single toad.

A glance at the structural features of this urceolarian (as drawn in FIGURE *B*) shows clearly that it is a form quite distinct from *Trichodina pediculus*. Davaine (1854) and Vulpian (1857) have described urceolarians in the urinary bladder [1] of *Triturus cristatus*, but they believed them identical with the forms found on the gills of the larvae of the same animal. Later, however, Rosseter (not knowing of the French investigators' work) rediscovered urceolarians in *Triturus cristatus*, and after a careful examination of both their structure and habits concluded that they were different from *T. pediculus*. He did not attempt a systematic analysis and description, and consequently Fabre-

[1] Voigt (1903, p. 96) has observed at various seasons of the year immense numbers of "*Trichodina spec.*" in the urinary bladder of *Perca fluviatilis* Linné.

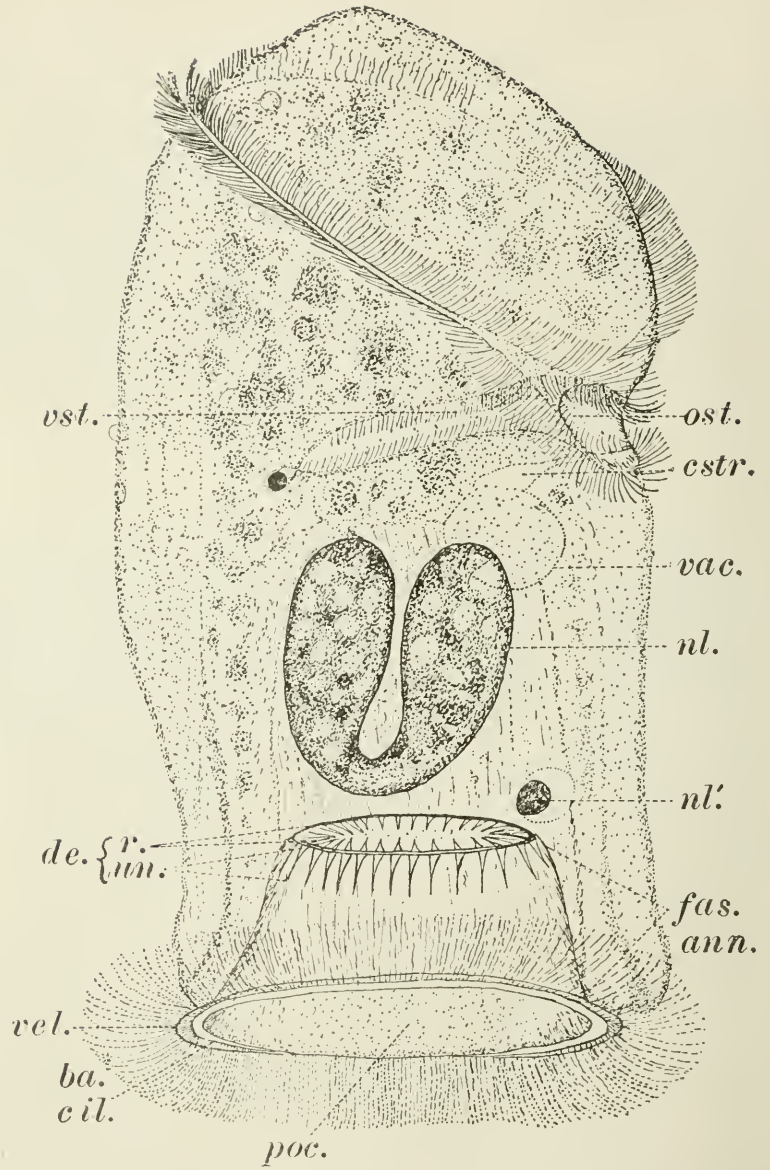

FIGURE *B.* — *Trichodina urinicola*, n. sp., from a camera-lucida drawing. The rudimentary velum (*vel.*) is shown as an attenuated band immediately outside the line of attachment (*ba. cil.*) of the locomotor cilia. Denticulate ring of 28 teeth (*de.*), each with a centripetal ray (*r.*) and a centrifugal piece corresponding to the hook (*un.*) of other species. Macronucleus (*nl.*), micronucleus (*nl.'*), and contractile vacuole (*vac.*) are shown, likewise the canal (*cstr.*) leading from the vacuole into the vestibulum (*vst.*) and the entrance (*ost.*) to the latter. At the deep end of the vestibulum a particle of food is seen. The *double* row of adoral cilia is to be noted.

Domergue (1888, p. 221) declined to recognize Rosseter's urecolarian as a new species, but on the strength of his own examination of the species claimed that it was absolutely identical with *T. pediculus*. In addition to structural differences from *T. pediculus*, which in themselves were most convincing, differences of reaction toward *Hydra* were shown by Rosseter, who performed the following extraordinarily interesting experiment, which I give in his own words (1886, p. 931–932).

"*Hydræ* from a pond . . . were examined, and found free from *Trichodina pediculus;* larvae of *Triton cristatus* were taken from another pond at some distance, and specimens of *Trichodina* were detached from the branchiæ, taken up with a pipette, and placed with the *Hydræ* in a watch-glass, a small quantity of water being added. Specimens of *Trichodina* were taken from [the bladder of] a newly dissected newt, put into a watch-glass with a small quantity of water, and one of the *Hydræ* added. The former was used as a control experiment, and attention was specially directed to the latter.

" . . . The *Trichodina* [from the bladder] took no notice of the *Hydra*. Some settled themselves down in a quiescent condition, whilst others would spin round with a concentric motion. . . . If they struck against the *Hydra* they recoiled, as it were, from the contact, and continued their course; but at no time was there any adhesion to show their ectoparasitic nature . . . some of the *Trichodina* lived about three hours afterwards, and then died. . . .

"It was otherwise, however, with the control experiment where the *Trichodina* at once attached themselves to the *Hydra*. Both lived for days, the former seeming as much at home on the tentacles of the *Hydra* as on the branchiæ of the larvae of *Triton*."

From Rosseter's brief description and from his plates the writer became convinced that his *Trichodina* and the new *Trichodina* about to be described are identical. Since that time the urogenital organs of an adult *Triturus* have been examined and the identity of the two forms proved beyond question. Since Rosseter was the first clearly to distinguish this endoparasitic *Trichodina* from the epizoic *T. pediculus*, the writer regrets that the animal to which he desires to give the name *urinicola* — because it inhabits the urinogenital organs, especially the bladder

— cannot, according to the usage of systematists, be known in future as Rosseter's species. I am indebted to Mr. G. R. de Beer for suggesting the specific name.

Structure. — The adhesive disk, or cup (*poc.*), though it possesses the same structures, differs in several important ways from that found in *T. pediculus*. The velum (FIGURE *B*, *vel.*) has nearly disappeared, though it may, I think, be recognized as a narrow rim lying just outside the base of the crown of cilia. As in *T. steinii*, there are no cirri, and it is probable that the ciliary crown is composed of true cilia, and not membranellae as in *T. pediculus* and *T. steinii*. The cilia, however, are rather thicker than those normally found in other *Trichodinae*, so that they may perhaps be looked upon as modified membranellae. The most striking way in which *T. urinicola* differs from the other *Trichodinae* is in the deeply invaginated sucking disk, a modification undoubtedly serviceable in enhancing the animal's powers of adhesion, made necessary by its more sedentary mode of life. The wall of the cup (*fas. ann.*) is homologous with the ring band of *T. pediculus*, and is but faintly striated, being without the well-formed ribs found in that species. The denticulate ring has undergone a decided degeneration, and is characterized by a variable number of teeth (28–36; *T. pediculus* has 24–26). Each "hook" (*un.*), instead of lying in the same plane with its "ray" (*r*), makes an angle with it of about 120 degrees. Also, as FIGURE *B* shows, the hooks and rays are themselves much less elaborate than the corresponding structures in *T. pediculus*. Indeed, close examination of the denticulate ring seems to indicate (as shown in FIGURE *B*) that the ring is in reality homogeneous: that the denticles are not separate, but continuous one with another. However, one cannot doubt that the denticles were once separate, and consequently it is to be regretted that the stages following the reproduction of *T. urinicola* have never been observed.

The peristome field is bounded by a *double* row of dexiotropic cilia, which, as is shown in FIGURE *B*, commences immediately dorsal to the vestibular opening, circles round the left side of the animalcule, appearing again on the dorsal side, where the line between the two rows of cilia can be clearly seen, and finally reaches the vestibule by way of the right margin of the peristome field.

Wallengren (1897[b]) has described the peristomal crown of *U. mitra* as composed of membranellae rather than cilia, but it seems highly improbable that this holds true for *T. urinicola*, since the highest powers of the microscope reveal nothing except cylindrical tapering cilia in the rows surrounding the peristome field. The rows of cilia gradually separate from each other shortly before they reach the vestibulum, one making a peculiar turn so as to enter the vestibule on its ventral wall, while the other enters on the dorsal wall. The arrangement of the peristomal cilia makes it evident how food is driven into the oesophageal opening. The cilia continue to the bottom of the vestibule.

The vestibulum is a spacious cavity inclining somewhat to the right, and becoming narrowed as it progresses inward (Figure *B*, *vst.*). Under some conditions, the walls of the vestibulum appear to be marked by circular striations; but whether or not this is a constant feature, could not be determined. Under favorable circumstances a fairly well-defined canal (the reservoir of Wallengren) can be seen (*cstr.*) leading from the contractile vacuole (*vac.*) into the outer end of the vestibulum. The contractile vacuole is a large structure, seen clearly in most specimens; in life it is sluggish, its periods of systole and diastole being both far apart and irregular. In *T. pediculus*, on the contrary, they occur with great regularity every 10 to 12 seconds. The position of the anus was not determined in *T. urinicola;* Wallengren, however, has described it for *Cyclochaeta domergueii* as existing on the right side of the bottom of the canal ("reservoir") leading from the contractile vacuole.

The ectoplasmic layer of the body is thin and moderately firm. It contains but few granules. The endoplasm, on the contrary — as both the photomicrographs (Pl. 2, figs. 9, 10) and Figure *B*, show — is highly granular and has running longitudinally through it several noticeable streaks (myonemes?). The macronucleus (*nl.*) appears to lie in an endoplasmic pocket adjoining the floor of the sucking disk.

Nuclear condition. — The shape of the macronucleus varies somewhat; however, in general it has the form of a saddle-bag, or a dumbbell bent in the middle. It is highly granular and has a great affinity for nuclear stains. The micronucleus (*nl.'*) is

much more unusual. In *T. urinicola*, contrary to the conditions in other species of *Trichodina*, the micronucleus is quite separate from the macronucleus, and, in addition, is enclosed in a large vacuole. In fact its morphological characteristics are suggestively in keeping with Lewin's (1911) contention that the micronuclei of infusorians during their asexual cycle lead an existence quite independent of the rest of the cell body. It is possible that the vacuole surrounding the micronucleus may be an artifact due to shrinkage, yet, as none of the other structures shows signs of shrinkage, it seems unlikely that such is the case.

The writer has not encountered *T. urinicola* during an epidemic of reproduction, so that the changes associated with division cannot be described.

Technique. — The most successful preparations of *T. urinicola* were made by fixing in Schaudinn's fluid (20 minutes) a wet smear of mucus squeezed from the bladder, and staining with methylen blue until the proper degree of differentiation was obtained; then dehydrating with acetone and xylol, and mounting. Permanent preparations can be made in this way in a half-hour or less. Acid fuchsin was tried after fixation in Schaudinn's fluid, and also Heidenhain's iron haematoxylin; but preparations stained with methylen blue were much more satisfactory, and were the ones employed in making the photomicrographs.

Other Trichodinae.

It seems desirable to refer briefly to accounts of other urceolarians, both to insure that the species here named *Trichodina urinicola* has not been described under some other name, and to show its probable relationships to other Urceolariidae.

Another urceolarian, seen first by Wegmann (1887, p. 299–301, Pl. 12, figs. 13, 14) on the gill filaments of *Patella vulgata*, and described later by Cuénot (1891[b], p. 82, 83) under the name of *Trichodina patellae*, has recently been investigated by Caullery et Mesnil (1915) and found to contain symbiotic zoöxanthellae. The form is an interesting one, but it clearly does not belong to the genus *Trichodina* as defined by Wallengren, since it possesses a non-denticulate horny ring in its sucking disk. As far as can be ascertained from Cuénot's description, it must be related

closely to *Urceolaria mitra*. Consequently, until further morphological evidence is adduced, the name should be changed to *Urceolaria patellae* (Cuénot). Cuénot's other species — *Cyclochaeta synaptae* (1891[a], p. 289; 1892, p. 6) and *Trichodina antedonis* (1891[a], p. 290) — must be redescribed before they can be definitely placed in Stein's family Urceolariidae.

Chatton's (1910) *Trichodina labrorum*, which was obtained from the gills of the fishes *Symphodus tinca* Linné and *S. melops* Linné, is so similar to Wallengren's *Cyclochaeta domergueii* from *Gasterosteus pungitius* (erroneously spelled *Gastrateus punzitius*, fresh-water stickleback) that it seems questionable whether it is to be regarded as a new species. The only conspicuous difference between the two descriptions relates to the structure of the denticulate ring, and since Chatton's description of this structure is by no means thorough, it seems wise, for the present at least, to leave open the question of identity.

Other species of Urceolariidae have been observed from time to time, but inadequate descriptions make it impossible to give them definite systematic position. Busch's (1855) *Trichodina* is probably *T. urinicola*, while Cohn's (1866) has been identified with the genus *Licnophora*. Miss Embleton's (1901) *Trichodina* seems to approach more closely *T. urinicola*, and Zacharias' (1900) form is probably correctly diagnosed as *T. pediculus*.

The Trichodinae and their Hosts.

Trichodina is frequently described as an "ecto-parasite," which, strictly speaking, is not true, for the *Trichodinae* found on the gills of *Necturus* and *Triturus*, at least, cannot in correctness be considered parasites. As Caullery (1922, p. 61) points out, it is a matter of common knowledge that many infusorians are found upon certain marine or fresh-water organisms distributed over very limited areas of their body. However, they do not depend upon their host for nutrition, but rather utilize the currents of water set up by the animal, ingesting such particles of food as are brought within reach. The *Opercularia*, for instance (Fauré-Fremiet, 1906), are found attached to many fresh-water animals (*Gammarus*, *Cyclops* and *Notonecta*), and if detached from their hosts soon perish; however, if they are carefully removed from the host and attached to a glass rod that is kept

rotating in a vessel containing water which is occasionally renewed, they live on indefinitely. A similar condition is found among the *Trichodinae*. Externally they are found in great abundance on the gill filaments but rarely if ever on other portions of the integument. When removed from the gills they soon die, even though large portions of the gill are removed at the same time and put into the culture fluid. Clearly, therefore, the *Trichodinae* found on amphibians are not parasites, but epizoic forms living as commensals. Though the case for commensalism is not such a clear one in the association of *Trichodina* with *Hydra*, yet undoubtedly the protozoans are benefited by the small movements of *Hydra*, and certainly by those of the *Keronae* found also in association with *Hydra*.[1] *T. urinicola*, on the other hand, is most certainly a parasite, since it is attached to the wall of the bladder and depends entirely for its subsistence upon food derived either from the bladder wall or from the urine. It seems incapable, moreover, of living outside of the urinogenital organs. The writer, in addition, is inclined toward the belief that the moribund condition of the toad referred to above was caused by the *Trichodina* infection. An infection by *Cyclochaeta domergueii* is known to have killed fish (Hofer, 1904). But what is the relation, if any, between the endoparasitic, *T. urinicola* and the epizoic *T. pediculus?*

Caullery (1922, p. 60) has shown that epizoic commensalism, particularly if there is a tendency toward permanent adherence, marks the threshold of true parasitism, and this indeed seems to be the case with the *Trichodinae*. *T. pediculus* so long as it inhabits purely aquatic animals — fresh-water fish, *Necturus*, the larvae of *Triturus*, *Neritina*, or *Hydra* — retains its specific morphological characters and continues its life of an epizoic com-

[1] "At times the Hydra seems to be strangely knotted, and ungainly in outline, when, upon close examination, we ascertain that it is crowded with a swarm of Keronas, upon several of whose convex backs, one, two or three Trichodinas are seated, enjoying the pleasure of locomotion without the effort of producing it. Not infrequently an individual may be seen to leave its reptant mode of progress and take to the surrounding element. . . . Presently it returns to its more quiet mode of life, sliding spectre-like over the animate surface. . . ." (James-Clark, 1866, p. 116; Ann. Mag. Nat. Hist., p. 405).

mensal. However, when found on animals which have metamorphosed and forsaken their aquatic existence, the *Trichodinae*, having had to leave the gills, are found in the bladder. The new environment, one is lead to believe, has in time occasioned structural changes in the animal itself, so that a form resembling *Trichodina pediculus* may thus have been converted into *Trichodina urinicola*.

Such a theory, according to which the modification of the parasite phylogenetically accompanied that of the host, is not without parallel in other phyla of the animal kingdom. Wright and Macallum (1887, p. 2) have drawn similar conclusions in case of certain trematodes. The Gyrodactylidae are found parasitic on the gills of many fresh-water fishes. *Sphyranura osleri*, which is not far removed taxonomically from the Gyrodactylidae, is found on the gills and on the integument of *Necturus;* while *Polystomum integerrimum*, which is very close to the *Sphyranurae*, is found in the urinary bladder of frogs and toads. Such a parallel is the more striking since the intermediate form, as with *Trichodina*, is found upon *Necturus*, which phylogenetically is intermediate between fishes and frogs. Wright and Macallum suggest (p. 2) "that both the frog and *Necturus* have inherited their parasites from fish-like ancestors, the gills of which were infested by *Gyrodactylus*-like forms," and it may with reason be suggested that likewise the toad and adult *Triturus* have inherited *T. urinicola* from fish-like ancestors the gills of which were infested by forms similar to *T. pediculus*.

Summary.

The unusual changes attendant upon the reproduction of *Trichodina pediculus* by division are described in the text, and photomicrographs of the changes in the sucking disk are shown in Plates 1 and 2. A parent individual possessing a ring of twenty-four denticles divides, giving rise to two individuals, each with a ring of twelve teeth. This ring of twelve subsequently disintegrates concomitantly with the development of a new ring of twenty-four pieces; hence after reproduction forms may exist which possess two horny rings, one with twelve, the other with twenty-four, denticles. This accounts for *Trichodina diplodiscus* Stein.

A new species of *Trichodina* is described, which is parasitic in the urogenital organs of toads and *Triturus*. It was seen previously by Rosseter, who regarded it as different from *T. pedículus*, but did not propose a specific name. The name now proposed is *Trichodina urinicola*. A drawing of it is shown in FIGURE *B*, and photomicrographs in Plate 2, figures 9, 10. *Trichodina urinicola* differs from *Trichodina pediculus* in the possession of a more elongated body, a deeply invaginated sucking disk, a micronucleus rather remote from the macronucleus, and a greater number of simpler denticles in the denticulate ring. *Trichodina pediculus* is an epizoic commensal, while *Trichodina urinicola* is a true parasite.

The suggestion is made that the ancestors of *Trichodina urinicola* became modified phylogenetically with their host, and that the original form, whence it was derived, was closely related to *Trichodina pediculus*.

The classification of the family Urceolariidae by Wallengren has been adopted (see p. 4–5). In the genus *Trichodina* the following species are recognized:

Trichodina pediculus (Müller) Ehrb., *Trichodina steinii* Clap. et Lach., *Trichodina urinicola*, n. sp.

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EXPLANATION OF PLATES.

Abbreviations.

ann.	Ring.
ann'.	Nascent ring.
ba. cil.	Base of ciliary crown.
cil.	Cilia.
cir.	Cirrus.
cstr.	Reservoir (=cisterna; canal from *vac.* to *vst.*).
de.	Denticulate (horny) ring.
fas. ann.	Annular band ("Ringband").
lmb.	Border ("Saum").
mbl.	Membranella.
nl.	Macronucleus.
nl'.	Micronucleus.
ost.	Entrance to vestibule.
r.	Ray of denticulate ring.
un.	Hook of denticulate ring.
vac.	Contractile vacuole.
vel.	Velum.
vst.	Vestibulum.

Figures 1–8 were stained by the Giemsa azur-eosin process and were all taken from the same slide.

Figures 9–10 were stained with methylen blue.

The combination used in making the photographs (except Fig. 9) was a Leitz $\frac{1}{12}$-inch apochromatic oil-immersion objective, and a number 8 compensating ocular. As reproduced this represents a magnification of approximately 600 diameters.

PLATE 1.

Fig. 1.—Normal *Trichodina pediculus* from *Necturus* seen from the *oral* face, the body being interposed between the observer and the sucking disk. The dark oval bodies above are nuclei of red blood cells. The nucleus of the *Trichodina* is large and has the form of a nearly complete ring; it is displaced in this specimen slightly downward. The focus chosen for this photograph was selected so as to show the structure of the denticulate ring on the upper half of the figure. It will be seen that the outer projection ('hook', *un.*) is not attached to the ray (*r.*) immediately centripetal to it, but to the one next thereto, counter clockwise. This explains the error into which James-Clark fell when he described the parts as though the ray belonging to a hook was the one directly centripetal to the base of the hook,—an error which Wallengren did not rectify. The greater and lesser ribs of the ring band (*fas. ann.*) are also seen in this figure. The other structures of the sucking disk are seen to greater advantage in the next figure.

Fig. 2.—The same individual focussed deeper to show the velum (*vel.*) and ring band (*fas. ann.*). At the union of the inner third of the velum with its outer two thirds a faint line is seen (*ba. cil.*), which marks the base of the ciliary crown. The cilia themselves can be seen between the two erythrocyte nuclei which cover parts of the animal. Close examination of the photographic print with a magnifying-glass reveals a very faint radial striation of the velum itself.

Figures 3–6 are *aboral* views (*i.e.* looking at the attaching surface).

Fig. 3.—*T. pediculus* immediately after division, showing an inner denticulate ring bearing twelve hooks and, outside it, the fundament of a new ring (*ann'.*) containing twenty-four imbricated pieces. The precise form of each denticle (both hook and ray) of the inner ring is shown with great clearness. Both horny rings are within the peripheral portion of the ring band.

Fig. 4.—The same individual as that seen in Fig. 3. The macronucleus (*nl.*) is seen as a short, thick, structure having the form of a half ring. The concentrated condition of the macronucleus is characteristic of forms which have recently divided.

Fig. 5.—The same taken in green light to show the macronucleus.

Fig. 6.—The same at very deep focus to show the deep structures in the ring band. This shows the greater and lesser ribs of the ring band better than they are shown in Fig. 1. Note also the appearance of the new ring (*ann'.*).

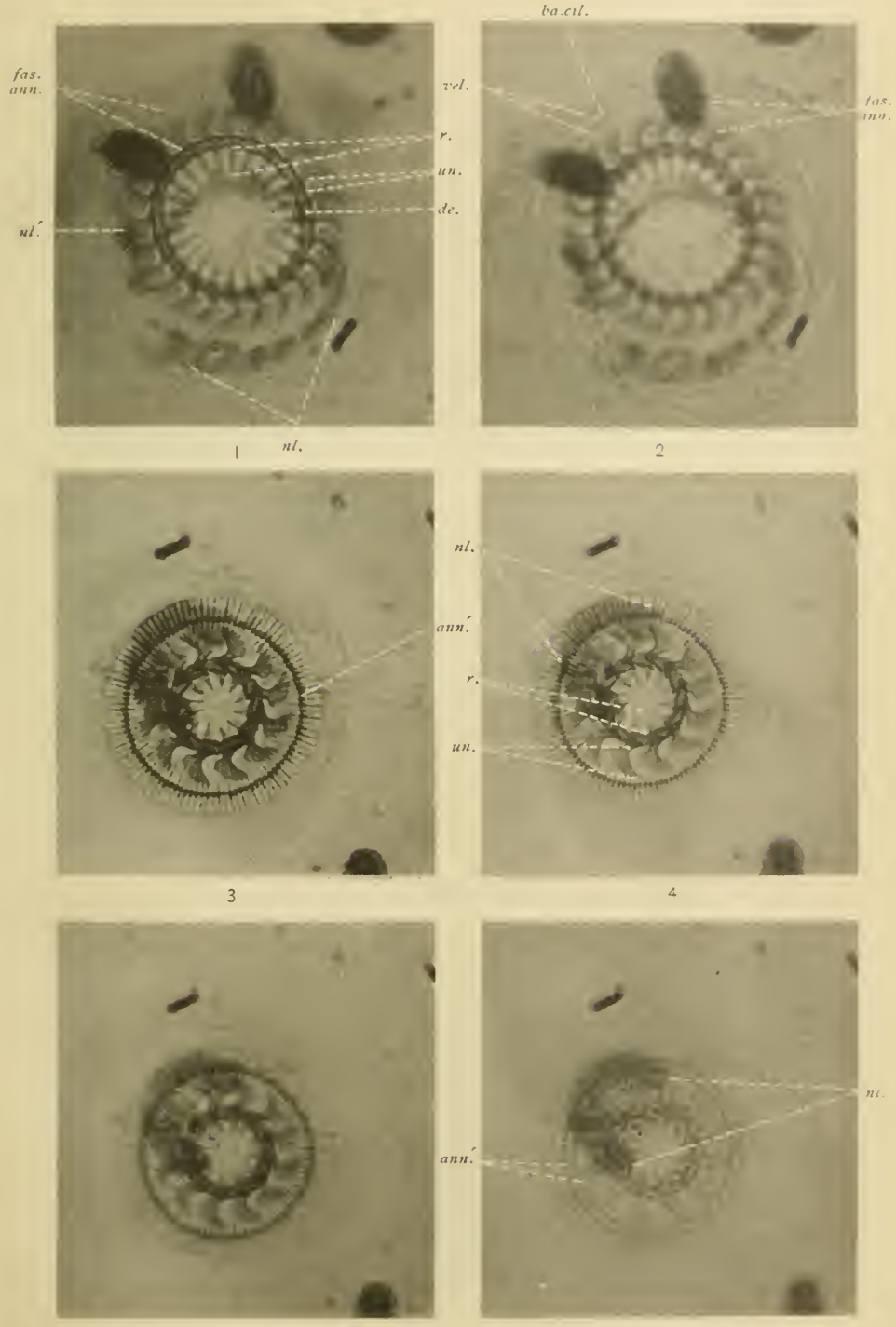
fas. ann.
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PLATE 2.

In Figures 7 and 8 both specimens are viewed from the *aboral* (*i.e.* adherent) end.

Fig. 7.—The lower specimen shows *T. pediculus* some time after division. The inner ring of denticles is disappearing, while the new ring is almost completely developed. The appearance of the inner ring demonstrates clearly that it is reabsorbed and not sloughed off as such. The condition of the inner ring in this specimen shows in a very clear way the structural features of the denticles noted in Fig. 1.

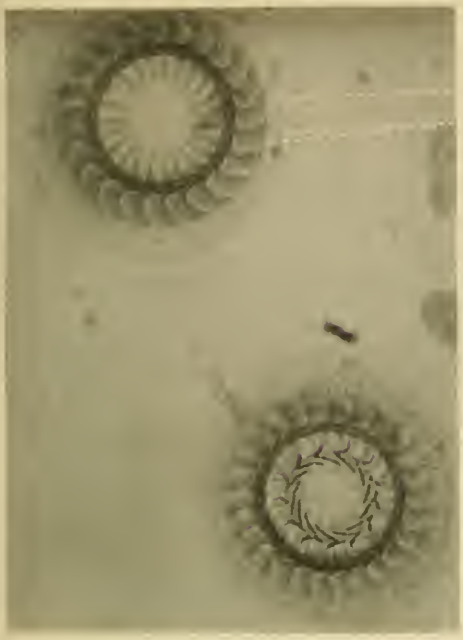
The upper individual is a normal *T. pediculus* as it appears after the inner ring has entirely vanished.

Fig. 8.—The same as Fig. 7 at slightly deeper focus. The cilia and velum are shown in this figure with unusual clearness.

Fig. 9.—*T. urinicola*,s p. n., from a toad (low power: mag. approximately 100). On account of the great body length, all the individuals of the preparation have the long axis parallel to the slide, so that the invaginated sucking disk is always seen in side view. The macronucleus is conspicuous in nearly every individual. The rectangle indicates approximately the field exhibited in the next figure.

Fig. 10.—*T. urinicola*, sp. n., under higher power (mag. about 600). Numbering the three complete specimens from right to left, we see in:

1. An individual of usual shape, similar to the one shown in Figure *B*, p. 16. Dumbbell-shaped macronucleus (*nl.*). Contractile vacuole (*vac.*). Near the oral end the line of adoral cilia is seen. The cup-shaped sucking disk is particularly to be noted. The sides of the cup represent the ring band (*fas. ann.*).
2. At the left side of this specimen the vestibular opening (*ost.*) is visible with its two rows of cilia. The micronucleus (*nl'.*), enclosed in a vacuole, is *apparently* in contact with the macronucleus. A few of the "hooks" in the wall of the cup are visible.
3. Close examination of this individual will reveal some of the "rays" (*r.*) of the horny ring in the bottom of the sucking cup.



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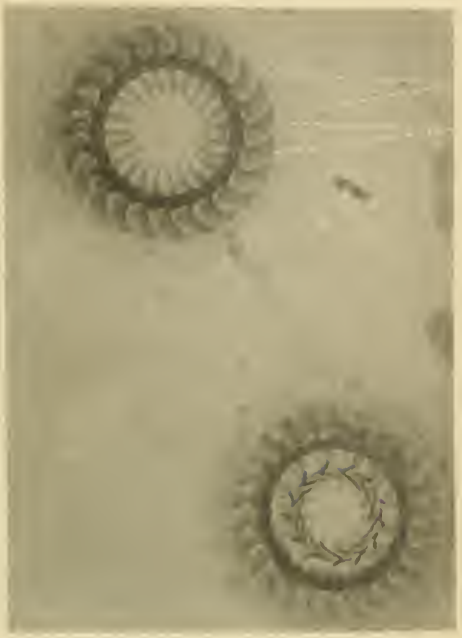

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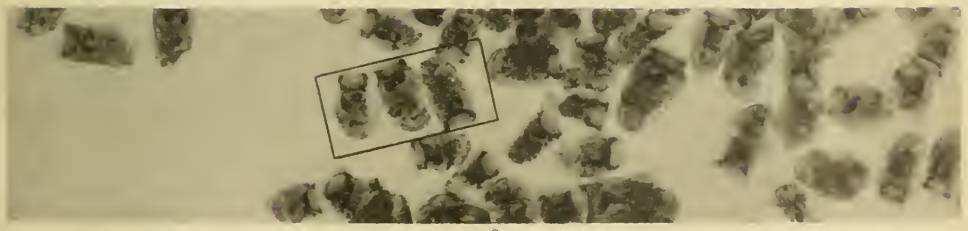

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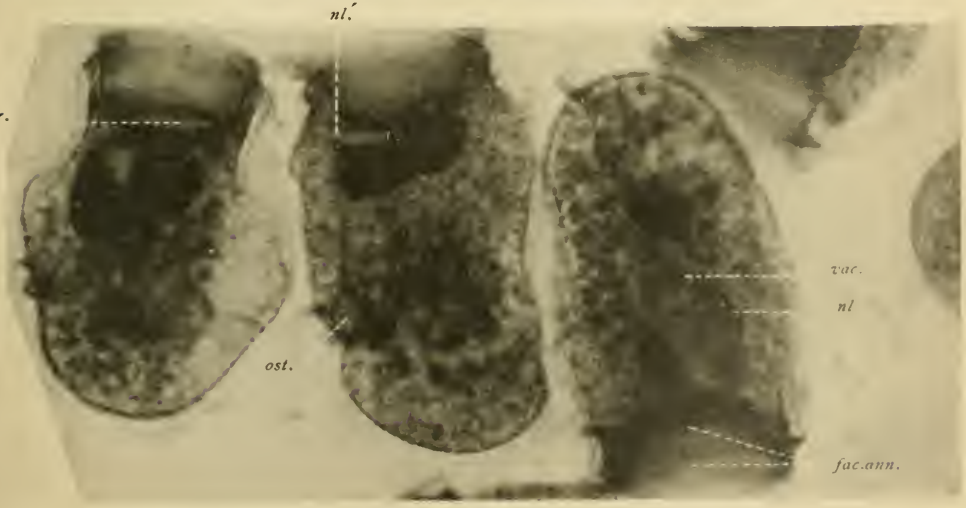

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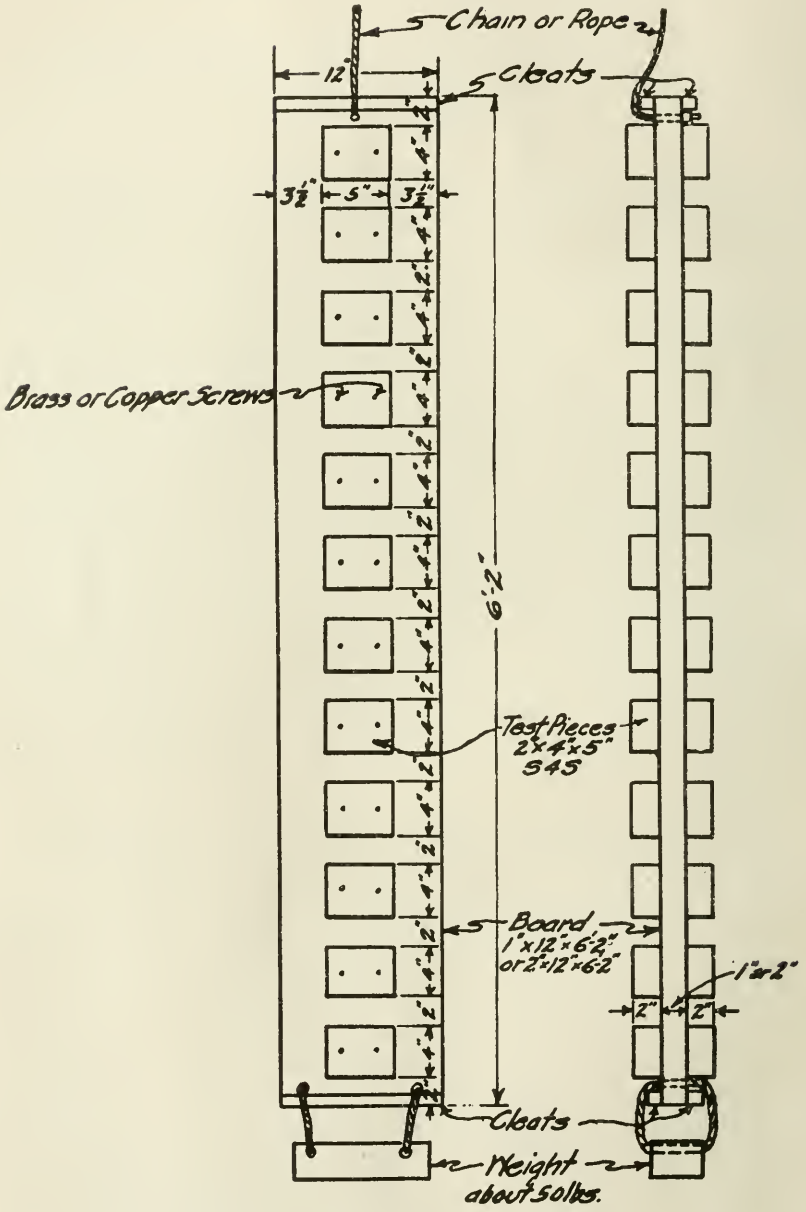
No. 2.—A NEW SPECIES OF TEREDO FROM FLORIDA.

BY WILLIAM F. CLAPP.

The material on which this species is based was removed from test blocks of wood placed in the water by the Committee on Marine Piling Investigations of the National Research Council, for the purpose of obtaining information regarding the distribution, rate of growth, and other facts in the life-history of the different species of shipworms. This Committee has succeeded, through the coöperation of various agencies, in having uniform tests made of several hundred localities in continental and island harbors. Tests are being made from Maine to Key West, Florida, on the Atlantic coast; from Tampa, Florida, to Corpus Christi, Texas, on the Gulf coast; in Cuba, Haiti, Santo Domingo, Porto Rico, the Virgin Islands and the Panama Canal Zone. The Pacific coast system extends from Mazatlan, Mexico, to Dutch Harbor, Alaska, with test boards also located on several of the Hawaiian Islands and at Tutuila, Samoa. Similar work has been undertaken at Bermuda by the Bermuda Biological Station under the direction of Dr. E. L. Mark, and the continental stations on the Atlantic and Pacific are being extended into Canadian waters under the direction of the Biological Board of Canada.

The idea of obtaining regular and frequent records of the shipworm attack during an entire year, resulted in the designing of a special test board (text-fig. 1) the construction of which may be briefly described as follows. Pieces of 2- by 4-inch board, preferably of wide-ringed, sappy yellow pine, are sawn into 5-inch lengths. Twenty-four of these blocks are fastened with brass or copper screws to a board 6 feet long and 12 inches wide. The blocks are marked with small copper tags, numbered from 1 to 24. The board is then weighted and submerged. Every two weeks, after being placed in the water, a block is removed and replaced with a new one. The blocks when removed are sent for examination to the Committee on Marine Piling Investigations. By wrapping the test block in many thicknesses of paper, it has been found that the shipworms and other organisms will survive a



TEXT-FIG. 1.—Sketch showing test blocks.

journey of ten days or more, arriving at the laboratory in excellent condition for study.

The nomenclature of the various parts of the shell is that of Bartsch (1922, p. 6, fig. A), except that the portion of the shell described in Dr. Bartsch's paper as the posterior part, will be referred to in this paper as the auricle.

I wish here to express my sincere thanks to Professor S. C. Prescott, for his kindness in placing laboratory facilities at my disposal at the Massachusetts Institute of Technology.

Teredo (Teredo) bartschi, sp. nov.

Type-specimen, no. 45301, Museum of Comparative Zoölogy, from Port Tampa, Florida. Additional specimens from the type locality are also in the United States National Museum; the Academy of Natural Sciences, Philadelphia; the American Museum of Natural History, New York; and the Museum of Comparative Zoölogy, Cambridge, Massachusetts (no. 45302).

Description.—Shell subglobular, milk-white, covered with a thin, deciduous, light horn-colored periostracum. The anterior portion of the shell joins the anterior median area in a gentle curve, the ventral edge making an angle of approximately 100°. Exteriorly, the anterior portion is marked with minutely denticulated ridges. At the ventral edge, these ridges are one-half as wide as the intervening spaces, the spaces becoming irregularly wider dorsally, where the ridges are one-fourth as wide as the spaces. Beginning at the ventral edge there are 15 of these ridges in one millimeter. On that portion of the posterior ridge near the anterior median area, there are 80 denticles to the millimeter. These denticles have sharp, slightly curved points, supported by round blunt bases (Pl. 4, fig. 9). The anterior median area, at a point opposite the ventral edge of the anterior area, occupies slightly less than one-third of the entire median area, and bears the usual denticulate ridges, there being 15 of these ridges to 0.5 mm. in a line continuous with the ventral border of the anterior area. In the type there are 16 of these ridges at this point, separated only by very finely incised lines. Each ridge bears closely crowded, broad denticles, of which there are 27 to the millimeter on the anterior ridge in the vicinity of its junction with the ventral ridge of the anterior area (Pl. 4, fig. 10).

The ventral ends of these ridges bend back over the anterior median area at an angle of 45°, becoming gradually narrower and disappearing in the middle median area; or they may be only discernible as faint lines of growth. The middle median area is the complement of the anterior median area, being narrow dorsally and broad ventrally. At that portion of the shell directly opposite the ventral edge of the anterior area, the middle median area is slightly narrower than the anterior median. The anterior third of this area is convex, and roughened by the continuation of the ridges of the anterior area as growth lines; the posterior two-thirds is concave and smooth. The posterior median area is smooth and merges imperceptibly into the auricle, which is large and transparent.

Interiorly, in the left valve, a short, broad, curved and pointed hinge-tooth arises from directly beneath the umbone. The blade is two-thirds the length of the shell, slightly curved, broad, and reflected posteriorly, in the middle. Ventral knob large, of the same width as the ventral portion of the middle median area from which it arises; it is supported anteriorly by a delicate wall entirely free posteriorly and ventrally. Internal shelf of the auricle strong and well marked.

Pallets of the type of *Teredo navalis* Linné. Stalk slightly longer than the blade. The lower half of the blade is calcareous, broad, flat on the inner, convex on the outer face, somewhat abruptly contracted at the juncture with the stalk, and enveloping the stalk with a short thin sheath. In the upper half of the blade, the calcareous portion is covered by a light yellowish horn-colored periostracum, the exterior face of which is more deeply cupped than the interior. Through the semi-transparent periostracum the calcareous portion of the blade can be seen to continue distally, in an irregular form somewhat similar to a broad hourglass, with a deep sinus on either side.

At the posterior end of the tube, a short distance from the external opening, are two thin, sharp longitudinal ridges, or lamellae, arising from opposite sides of the internal wall and nearly meeting at the center. When in position, the broad surface of the blade of the pallet is at right angles to these lamellae (Pl. 3, fig. 3). At the external opening of the tube, on each side, between the lamellae, is a deep sinus.

The *measurements* of the type are: shell, height, 4 mm.; length, 4.2 mm.; pallets, total length, 5 mm.; stalk, 3 mm.; width of blade, 1.2 mm.

The dimensions given for the shell are those of a superimposed rectangle, exactly containing the shell, with the sides parallel to a line drawn between the centers of the dorsal and ventral knobs.

I take great pleasure in naming this species for Dr. Paul Bartsch of the United States National Museum.

Teredo bartschi belongs to the group of which *Teredo navalis* is the type. It may be distinguished from the other species of that group by the peculiar construction of the pallets. In *Teredo bartschi* the distal half of the blade is transparent, showing the internal calcareous cone, while in *T. morsei, novangliae, beaufortana,* and *T. beachi* of Bartsch, all but the distal extremity of the blade is calcareous and opaque. The dimensions of the pallets of the type specimens of the above species also show that *T. bartschi* differs in having the blade much shorter than the stalk.

		Total length of pallet	*Stalk*	*Blade*
Teredo	beachi	5.5 mm.	2.0 mm.	3.5 mm.
	novangliae	5.0	1.7	3.3
	morsei	5.1	1.7	3.4
	beaufortana	5.2	2.0	3.2
	bartschi	5.0	3.0	2.0

It will be seen from the above table that the dimensions of the pallets of the first four species listed are very similar to one another and very different from those of *T. bartschi.* When dry, the pallets assume a very different but characteristic appearance. The distal chitinous portion acquires the shape of the internal calcareous portion which it surrounds, while the lower portion is drawn in laterally to fill the sinus in the calcareous part and the cup is made nearly flat (Pl. 3, fig. 1). The internal partitions or ridges of the tube also serve to distinguish this species from any previously described species of Teredo *s.s.* on this coast. When the pallets are forced into the posterior end of the tube, the external convex surfaces of the blades, coming in contact with these sharp ridges, are forced in, pressing the internal flattened faces of the blades more closely together, and thus closing the external opening more effectually.

The embryos within the parent are reddish purple in color, and are frequently found in parents having a total length of only 20 mm. When ready to be expelled from the parent, the shell of the embryo is nearly circular in outline, approximately 0.27 mm. in height and 0.25 mm. in length. It is nearly transparent, light horn-colored, excepting in the vicinity of the edge of each valve, particularly that portion near the umbone, where there is a narrow band of reddish-purple color. When viewed in bulk, this color predominates. Directly beneath the umbone is a strong flat hinge-plate, with from four to six irregular, faint, incised lines.

The shell differs most constantly from that of the species described by Dr. Bartsch as *Teredo morsei* (Bartsch, 1922, p. 21), in the shape of the auricle. In *T. morsei* the height of the auricle is greater than the length, and the outline is subangular. In *T. bartschi* the auricle is produced posteriorly, the length being equal to the height, and the outline semi-circular. The great variation in the shell characters of Teredo and the objections to using these characters for distinguishing species, have been well described by Dr. Miller (1922, p. 309), who has called attention particularly to the variation in the auricle.

The destruction caused by this species is considerable. Test blocks from Port Tampa, Florida, submerged for twelve weeks, contained specimens with a tube length of 125 mm. Specimens from wood submerged for a longer period frequently attain a length of 200 mm. Test blocks submerged for eight weeks are often completely honeycombed (Pl. 3, fig. 4).

This species has been found at the following locations in the blocks placed by the Committee on Marine Piling Investigations. With the exception of Cedar Keys, Florida, it has always been found in company with *Bankia gouldi*.

South Carolina: Charleston. Rare. About one specimen of *Teredo bartschi* to 50 *Bankia gouldi*. No attempt was made by the embryos of this species to enter wood at this locality later than October 15 in 1922.

Georgia: Brunswick. Very rare. *Bankia gouldi* plentiful.

Florida: Fernandina. Rare. Attack occurring as late as November 15 in 1922.

Seddon Island. Rare.

St. Petersburg. Rare. Attack continuing to December 15 in 1922.

Port Tampa. Common.

Fort Dade. Common. No embryos in wood placed in water later than December 15, 1922.

Cedar Keys. Common. No attack at this locality later than November 15 in 1922.

MISSISSIPPI: Pascagoula. Not common.

Gulfport. Rare.

LOUISIANA: Port Eads. Common; 90% of the shipworm attack due to *Teredo bartschi*, 10% to *Bankiagou ldi*. No embryos entering the wood later than January 1, 1923.

TEXAS: Galveston (Fort Point). Not common; 10% of the shipworm attack due to *Teredo bartschi*, 90% to *Bankia gouldi*. Specimens received from this locality, in blocks submerged ten weeks, contained well-developed embryos in parents with a total length of 25 mm.

Galveston (Pier 18). Common; 90% *Teredo bartschi*, 10% *Bankia gouldi*. Specimens with 50-mm. tubes and containing embryos, were received from this locality in wood which had been submerged less than twelve weeks.

Galveston (Pier C, Southern Pacific Railway). Common. A block submerged six weeks contained many specimens with 40-mm. tubes.

Baytown. Very rare. In many hundred shipworms found in test blocks from this locality, but one *Teredo bartschi* occurred.

Aransas Pass. Rare.

Corpus Christi. Common.

It will be noticed that this species has not been found in southern Florida, and this also is true of *Bankia gouldi*. The two species have a continuous distribution from South Carolina to Texas, excepting only the southern tip of Florida. Blocks from test boards at numerous stations in southern Florida contain many shipworms of several species, but in no case has an example of *Teredo bartschi* or *Bankia gouldi* been found south of Fernandina on the east coast or Tampa on the west coast. This distribution will be discussed in a later paper.

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EXPLANATION OF PLATES.

PLATE 3.

Fig. 1. Pallets of *Teredo bartschi*, dry, showing distorted chitinous portion. × 10.

Fig. 2. Pallets showing normal condition of the chitinous portion. Type, Mus. Comp. Zoöl., no. 45301. × 12.

Fig. 3. Pallets showing position in relation to the internal lamellae of the tube. × 10.

Fig. 4. Destruction caused by *Teredo bartschi* in test block submerged eight weeks. Natural size.

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PLATE 4.

Fig. 5. Exterior of right valve. Type, Mus. Comp. Zoöl., no. 45301. × 12.
Fig. 6. Exterior of left valve. Type. × 12.
Fig. 7. Interior of left valve. Type. × 12.
Fig. 8. Interior of right valve. Type. × 12.
Fig. 9. Dental ridges of the anterior portion. × 200.
Fig. 10. Dental ridges of the median portion. × 200.

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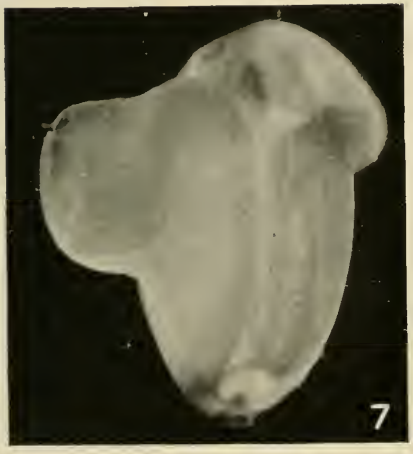
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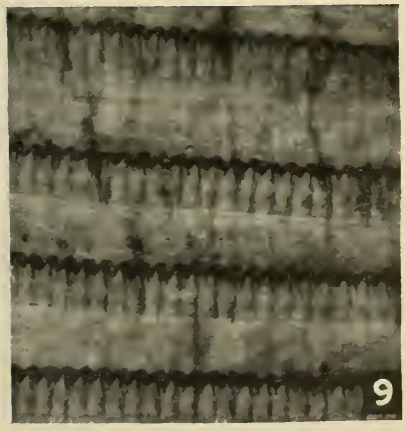
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Proceedings of the Boston Society of Natural History.
Vol. 37, No. 3,
p. 39–388, pl. 5–11.

VASCULAR FLORA OF COÖS COUNTY, NEW HAMPSHIRE.

By Arthur Stanley Pease.

BOSTON:
PRINTED FOR THE SOCIETY.
July, 1924.

PREFACE.

The preparation of the present Flora has been the work of spare moments of an amateur during nearly twenty years, and from this fact it is naturally bound to suffer, particularly as regards independence of judgment and bibliographic completeness. Pains have been taken, however, to overcome in some measure these inevitable handicaps, and from many generous friends assistance has been received without which the work could not have been finished. To Professor B. L. Robinson for continued and valued privileges accorded at the Gray Herbarium; to Professor M. L. Fernald for constant encouragement, companionship upon two collecting trips, and repeated help in difficulties of nomenclature or identification (particularly in the perplexing genus *Rubus*), and for advice as to the form of the work; to the late Miss M. A. Day, to Professor H. H. Bartlett, Professor H. St. John, Mr. C. A. Weatherby, Dr. F. Tuckerman, and Mr. F. G. Floyd for aid in identifications or in bibliography; to Professor J. G. Jack for determining a number of specimens of *Crataegus*[1]; to the authorities of the New England Botanical Club, the Boston Society of Natural History, and the New York Botanical Garden, and to Mr. E. F. Williams for allowing me to consult their respective herbaria; to Hon. J. R. Churchill, Mr. S. N. F. Sanford, and others who have put at my disposal specimens for examination; to Mr. Walter Deane, whose unceasing interest and enthusiasm, both in the herbarium and in the field, have been alike helpful and encouraging; to Professor W. O. Crosby for adding greatly to the value of the work by his sketch of the geology of the County; to Mr. A. H. Moore, of late prevented from participation, but in earlier years a most active collaborator; to Mr. C. A. Hathaway, for generously allowing the reproduction of some of his fine photographs of White Mountain plants; and a second time to the Boston Society of Natural History for generously making possible the publication of the work—to all these more is owed than I can easily express. But while

[1] The collections of this genus by Mr. W. Deane were determined by the late C. E. Faxon.

acknowledging this obligation I must relieve those who have been named from all responsibility for the resulting statements or identifications here expressed (except in the case of the genus *Crataegus*, as above noted) and for any errors to be found, and for this reason in the citation of specimens I have refrained from the use of the word *fide* or similar expressions of corroboration. Doubtless this course may detract somewhat from the value of the work in the eyes of those who feel particular respect for expert autopsy, but it is at least free from those embarrassments which arise when an expert unexpectedly meets his own name in print as responsible for off-hand determinations or for judgments subsequently reversed or superseded.

In the citation of specimens the catalogue may here and there be criticised for unnecessary fullness, yet careful students of plant distribution would, I feel confident, often welcome even more minute and abundant data than are here furnished. That there is a certain disproportion in the abundance of citations between the Presidential Range and other parts of the County is because the alpine region has become, as it were, a *locus classicus* (and as such deserving of more detailed notice) and also because such inequality is inevitable between an area scrutinized by scores of collectors through a period of a hundred and forty years and those remote townships which have been very rarely penetrated by a botanist.[1] Indeed, the comparative difficulty of access of certain parts of the County—notably the extreme northeastern corner—leaves the happy possibility that there are yet to be discovered small areas with floras as peculiar and interesting as those of some of the more famous localities.

Though this work will probably never reach a second edition it is yet possible that a supplement might some day be published, and to that end the author will be grateful for any indication of errors detected in it and for opportunity to examine specimens of species not here included or copies of articles which have been overlooked in his bibliography.

[1] From at least ten townships or grants the only specimens seen have been those collected by A. S. Pease or A. H. Moore.

"It will be at any time very acceptable to see some botanist, living in their neighborhood, attempt and execute a complete investigation of their Flora, which is probably the nucleus of Botany of the New England States."

—C. S. Rafinesque-Schmaltz in *American Monthly Magazine*, 1 (1817), 441, speaking of the White Mountains.

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Introduction.

Location and Area.

Coös, the largest and northernmost of the counties of New Hampshire, has an irregular, somewhat trapezoidal form, reaching its northerly point at Crown Monument, the boundary of New Hampshire, Maine, and Quebec (north latitude 44° 78′ 51″), its southern at Hart Ledge in Hadley Grant (latitude 44° 5′ 0″), and extending from the Maine line at Mt. Royce in Bean Purchase (west longitude 71° 0′ 50″) to the Vermont line at the Connecticut River in the western corner of Dalton (longitude 71° 45′ 53″). Its length between the first two points named is about 85.5 miles; its width, between the two latter, about 37.5 miles. Its boundaries on the north and west are natural: from Crown Monument westward to the headwaters of Hall Stream the watershed between the Magalloway and Connecticut on the one side and the St. Francis on the other; the western line follows Hall Stream and the Connecticut. A small area at the junction of these two streams, east of the village of Beecher Falls, is in Vermont. The southern boundary, separating Coös from Grafton and Carroll Counties, is the most irregular, and is entirely artificial, as is the straight line which forms the entire eastern border and divides this County from Maine.[1]

The space thus included contains a land area of about 1798

[1] Difficulties as to the exact location of this boundary are indicated by C. W.

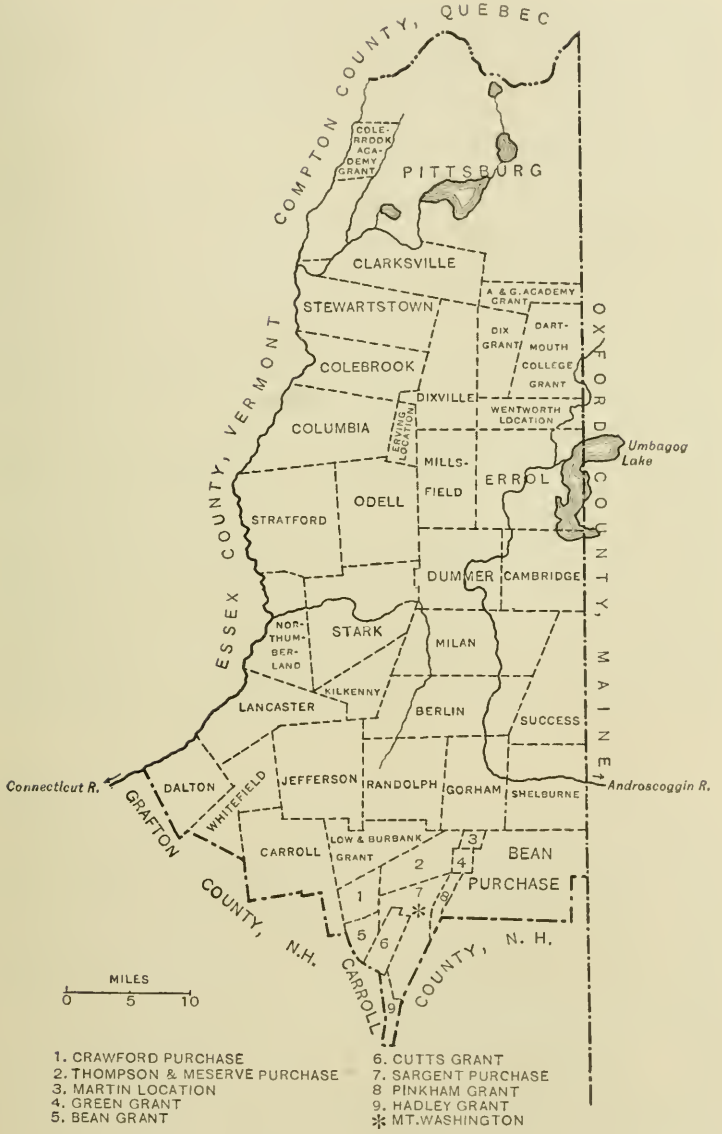
square miles (1,150,720 acres, according to the *Fourteenth U. S. Census*, **6** (1922), 124), divided into 43 townships and unorganized places known as grants, purchases, or locations, varying in size from Green Grant (about 1.5×2 miles) to Pittsburg (about 19 miles from north to south and 20 from east to west, with a length from northeast to southwest of nearly 29 miles). From north to south and east to west in order these are the following: Pittsburg (including Hubbard, Webster, and Carlisle of older maps), Colebrook Academy Grant, Atkinson & Gilmanton Academy Grant, Clarksville, Dartmouth College Grant, Dix Grant, Wentworth Location, Dixville, Stewartstown, Colebrook, Erving Location, Columbia, Errol, Millsfield, Odell, Stratford, Cambridge, Dummer, Stark, Northumberland, Success, Milan, Berlin, Kilkenny, Lancaster, Shelburne, Gorham, Randolph, Jefferson, Whitefield, Dalton, Bean Purchase, Martin Location, Green Grant, Pinkham Grant, Thompson & Meserve Purchase, Low & Burbank Grant, Sargent Purchase, Carroll, Cutts Grant, Bean Grant, Crawford Purchase, Hadley Grant.

On maps of this region *cf.* C. H. Hitchcock in *Mount Washington in Winter* (1871), 27–29; *id.* in *Geol. of N. H.* **1** (1874), 227–247 (on the topographic maps of the State); W. Upham in the same work, **1**, 67–68 (on maps of the White Mountains); A. H. Bent, *Bibliography of the White Mountains* (1911), 83–88.

For the purposes of this work the following more recent and complete maps have been employed:

1. The National Publishing Company's *Topographic Map of the White Mountains and Central New Hampshire* (1902; later editions are known as the Scarborough Publishing Company's *Topographic Map*, etc.), covering all the County from Lancaster, Kilkenny, Berlin, and Success southward, and based upon and superseding the U. S. topographic sheets for the same area, which are less complete in detail and in places erroneous in nomenclature.

Blood in *Appalachia*, **15** (1920), 15; **15** (1921), 219; who also calls attention to other matters of topographic uncertainty in northern Coös County; *cf. Geol. of N. H.* **1** (1874), 277 ff., especially 246–247. On the difficulties in the use of artificial political boundaries see an anonymous article in the *Bot. Gaz.* **21** (1896), 303–304. In spite of these disadvantages, however, it has seemed best to avoid others (which in the present instance appeared even greater) arising from any attempt to substitute purely natural boundaries.



TEXT-FIG. 1.—Map of Coös County.

2. The Walker Lithographic and Publishing Company's *Latest Map of Northern New Hampshire* (1892 and 1905), based on the maps in the *Geology of New Hampshire* (atlas volume) and other maps, and covering all the region north of the northern limit of the map just mentioned. Small in scale and with many errors, yet indispensable.

3. For the areas which they cover, the maps in the Appalachian Mountain Club *Guide to Paths in the White Mountains* (4 ed. 1920; 5 ed. 1922), though small in scale, are the most accurate in detail, combining the results of earlier maps with the independent surveys made by Messrs. L. F. Cutter, C. W. Blood, and others. Of these the maps which include the Presidential, Carter, Crescent, and Mahoosuc Ranges are the most nearly complete.

Not a little use has also been made of special maps, such as those in A. K. Chittenden's *Forest Conditions of northern New Hampshire* (U. S. Dept. of Agr., Bur. of Forestry, Bull. 55 (1905)), and large blue-print maps made for use in the operations of the Connecticut Valley Lumber Company in the northern part of the State. The U. S. Forest Service maps of the White Mountain National Forest (issued from time to time) are convenient in various respects but unreliable in topographic details. The topographical nomenclature employed in the present work, with a few exceptions and some additions, follows that of maps Nos. 1 and 2 above, save where such are superseded by No. 3.

Hydrography.

From the peak of Mt. Washington flow, in three different directions, waters which enter the sea at three different points, and in the basins of the three rivers receiving these waters (the Connecticut, Androscoggin, and Saco) lies the whole area of Coös County. About three-fifths of the County drains into the Connecticut, nearly two-fifths into the Androscoggin, and a small but important remainder into the Saco, of the main stream of which less than a half-mile is within the county limits. Mt. Field, at the meeting of the Connecticut, Saco, and Merrimack systems, is the only other triple watershed of this sort in the White Mountains, and it lies outside Coös County. On the hydrography of northern New Hampshire *cf.* W. Upham in *Geol. of N. H.* 1 (1874), 298–312 (also C. H. Hitchcock in the same

work, 1, 169–192; J. H. Huntington in the same, 1, 221–226). Opposite p. 300 is a colored map of the hydrographic basins. On a larger scale, distinguishing the tributary systems of the Magalloway, Upper Ammonoosuc, Israel, and Ammonoosuc from the larger systems of which they form a part, is the map in A. K. Chittenden, *op. cit.* On the statistics of the flow of water in different rivers see the *Reports of the N. H. Forestry Commission*, 1903–04, 135–219; 1905–06, 43–160. The fall of the streams is, in general, rapid. From its source in Third Lake (2058 feet) [1] the Connecticut descends, in a distance of about 76 miles, to an elevation of less than 800 feet at the western corner of Dalton. Lake Magalloway, at the head of the Magalloway system, the principal western branch of the Androscoggin basin, has an elevation of 2225 feet [2]; in the 39 miles to Lake Umbagog the Magalloway River falls to 1256 feet, and where the Androscoggin enters Maine, 86 miles from Lake Magalloway, it is but 690 feet above the sea.[3] The main descent of the Saco from its sources at Saco Lake, Carroll—it falls 580 feet in 2.6 miles (*Geol. of N. H.* 1, 312) —lies outside our area, but its tributaries,[4] the Dry (or Mt. Washington) River, the Rocky Branch, and the Ellis River, show a very rapid fall, as do many tributaries of the Androscoggin and the Connecticut. Long distances with more gradual descent, usually bordered by extensive alluvial areas, are found on the Connecticut from Pittsburg to Dalton, on the Magalloway below Aziscoös Falls (Maine) and the Androscoggin from Lake Umbagog to Errol Dam, and on the latter river from Dummer to Berlin and from Gorham to Shelburne.

Of lakes the largest is Umbagog, lying partly in Maine and partly in New Hampshire (Errol and Cambridge), the greatest length of which in a straight line is about eight miles, and the greatest breadth about two and one-half miles, with an area of 15.8 square miles (not all in New Hampshire, however).[5] First

[1] *Geol. of N. H.* **1**, 304. Fourth Lake, technically the source of the river, is but an insignificant pool.

[2] *Geol. of N. H.* **1**, 311.

[3] *Geol. of N. H.* **1**, 177, gives the height of the Grand Trunk Railway at the Maine line as 713 feet.

[4] For the names and statistics of the tributaries of the Connecticut see *Geol. of N. H.* **1**, 305; for those of the Androscoggin, **1**, 311; for those of the Saco, **1**, 312.

[5] *Maine State Water Storage Commission*, 4 Ann. Rep. (1913), 282.

(Connecticut) Lake (Pittsburg) is three miles long, with an area of three square miles[1]; Second Lake (Pittsburg) is two miles long (area 1.75 square miles); Third Lake (Pittsburg) is about a mile long (area 0.75 of a square mile); and Back Lake (Pittsburg) is of about the same size. Big Diamond Pond (Stewartstown), Akers Pond (Errol), Millsfield Pond (Millsfield), Christine Lake and Percy Pond (Stark), Success Pond (Success), and Head Pond (Berlin) are each about 0.5 of a square mile in area. Most of the County, with the exception of the deep valleys of the Presidential Range and its vicinity, is well provided with small ponds. These are especially abundant in the following regions: Pittsburg; from Wentworth Location to Stark; and in the vicinity of Lancaster, Whitefield, and Jefferson. The lakes and ponds are of three main types, as regards shoreline: (1) boulder-bordered glacial ponds with a rather constant water level; (2) muddy-bottomed ponds, often surrounded by encroaching peat bogs; (3) ponds and lakes with levels artificially controlled by dams and liable to great change as the water is drawn off and large spaces of mud exposed. Sandy shores are very rare. Among the fifty or more ponds examined in the preparation of this work the only sandy beaches of any size noted are: that at the outlet of Christine Lake in Stark and one at the north end of Head Pond in Berlin. Sandy bottoms are also infrequent.

Orography.

Large areas of the County lie at an elevation of over 2000 feet. Indeed, practically all the State north of the inlet of Second Lake (Pittsburg) and nearly the entire surface of Erving Location, Kilkenny, Low & Burbank Grant, Thompson & Meserve Purchase, Sargent Purchase, Bean Grant, and Cutts Grant, and more than three-fourths of Bean Purchase lie above this limit. The noteworthy ranges of greater height are the following (peaks printed in italics have more or less extensive ledges or other bare areas at or near their summits):

1. The mountains along the northern border from Crown Monument (2568 feet)[2] westward, rising to 2812 feet near Lake Magalloway[2] and 2629 feet at Mt. Prospect near Third Lake,[2] and

[1] *Geol. of N. H.* **1**, 304.

[2] *Geol. of N. H.* **1**, (1874), 218.

becoming an extensive plateau at the headwaters of Hall Stream.[1]

2. Along the east and southeast of Pittsburg and close to or crossed by the Maine line, lie Mt. Kent (or Abbott) [2] of 3000 feet, *Mt. Carmel,* or, as it is generally known, *Camel's Rump* (3711),[3] Prospect Hill or Striped Mt. (3200),[2] Bosebuck Mt. (2700) [2] and Half-moon Mt. (2526)[3]. A spur runs southwest through Mts. Magalloway (2900) [4] and Pisgah (2750) [5] to the Crystal Mts. (2500).[2]

3. The Dixville Mountains, extending north-northeast and south-southwest, both north and south of Dixville Notch and reaching their highest point in Dixville Peak in Erving Location (3156).[6] *Table Rock,* the most spectacular of the pinnacles rising above Dixville Notch, is 2454 feet in elevation.[7]

4. A crescent of mountains and high connecting ridges from Bowback Mt. in Stratford (2950), eastward to Sugarloaf (3470) [3] and Whitcomb Mt. (2300),[2] thence south and west to *Long Mt.* (3777) [3] and the *Percy Peaks* (3336 and 3149).[3]

5. The Pilot-Pliny Range runs southward from Pilot Mt. near Groveton (3640) [3] to Mt. Cabot (or South Peak) in Kilkenny (4190) [8] where it is joined from the northeast by a branch from *Green Ledge* (2708) [3] and *Deer Mt.* (3600),[2] thence south to *Terrace* (3670; from this point on the altitudes cited are taken from the National Publishing Company's map) and Round (3890) Mts., southwest to Mt. Waumbek (4020), and west to Mt. Starr King (3919). For descriptions of the topography of the neglected Pilot Range see W. H. Peek in *Appalachia,* 4 (1886), 219–225; 5 (1887), 30–38; 5 (1888), 215–222; the Appalachian *Guide to Paths*

[1] *Geol. of N. H.* **1,** (1874), 219.

[2] Walker's map. The *Geol. of N. H.* estimates (**1,** 210) Mt. Kent at 2800. At the point where the Maine-New Hampshire line crosses Prospect Hill the altitude is 2182 feet (*id.* **1,** 290).

[3] Tables of altitudes in *Geol. of N. H.* **1,** 210; 281–282.

[4] So Walker's map; the *Geol. of N. H.* **1,** 210, says 2600.

[5] So Walker's map; 2897 according to *Geol. of N. H.* **1,** 210.

[6] So *Geol. of N. H.* **1,** 210; according to *Walks, Drives, and Places of Interest around the Balsams* (n. d.), 4, and the Appalachian *Guide to Paths in the White Mountains,* 4 ed. (1920), 20, its height is 3118.

[7] *Geol. of N. H.* **1,** 282.

[8] *Guide to Paths in the White Mountains,* 4 ed. (1920), 19.

in the White Mountains, 4 ed. (1920), 18–22. The character of the vegetation on this range has been greatly changed, however, by extensive logging and by fires since the time of Peek's articles.

6. The Crescent Range extends east and northeast from Boy Mt. in Jefferson (2240) to Mts. Randolph (3090), Crescent (3280), Black Crescent (3322), *Black Mt.* (2509), and *Mt. Forist* (2050) at Berlin.

7. The Mahoosuc Range runs east and northeast from *Mt. Hayes* in Gorham (2600) to Baldcap Dome (3100) and *Mt. Success* (3570) [1] in the township of Success, and then passes on to yet higher peaks in Maine. This range lies as a northeastern prolongation of the Presidential Range, broken at Gorham by the valley of the Androscoggin River. Its botanical character, however, is very different from that of the Presidential Range.

8. The Baldface Range runs from Maine southwest into Bean Purchase, where are located *West Royce Mt.* (3215), *Eagle Crag* (3060), and *North Baldface* (3605), beyond which the range passes into Carroll County.

9. The Moriah-Carter Range [2] is, in part, roughly parallel to that last mentioned, from which it is divided by the valley of the Wild River, and includes the peaks of *Shelburne Moriah* (3750) and *Middle Moriah* (3775) in Shelburne, and *Moriah* (4065), *Imp Mt.* (3735), *North Carter* (4565), *South Carter* (4645), *Carter Dome* (4860), and the spur, Mt. Wildcat (4415), all in Bean Purchase.

10. The Presidential or Great Range [3] starts at *Pine Mt.* (2440) in Gorham, passes in a southwest and south direction, with the peaks of *Mts. Madison* (5390), *John Quincy Adams* (5470), *Adams* (5805), *Sam Adams* (5585), *Jefferson* (5725), *Clay* (5534), and *Washington* (6293); thence southwest with *Mts. Monroe* (5690), *Franklin* (5028), *Pleasant* (4775), *Clinton* (4275), *Jackson* (4012), and *Webster* (3876). From Mt. Washington there reaches to the south the extension known as *Boott Spur*, from which stretch two considerable ridges: one, the Montalban

[1] Mt. Ingalls of most maps. But see the Appalachian Mountain Club *Bulletin*, **13** (1920), 109.

[2] Usually called the Carter-Moriah Range, because more often traversed from the south. On this range *cf. Geol. of N. H.* **1** (1874), 185–187.

[3] *Cf. Geol. of N. H.* **1** (1874), 187–191; Goldthwait in *Appalachia*, **13** (1913), 1–23; *id.* in *Am. Journ. Sci.* 4 ser., **35** (1913), 4–6.

Ridge, running nearly south, including Mts. *Isolation* (3970), Davis (3800), *Stairs* (3423), *Resolution* (3400),[1] *Crawford* (3101), *Hope* (2520), and *Hart Ledge* (2009); the other, the Rocky Branch Ridge, without important summits in our area. Significant ravines on the east side of the Mt. Washington group are, from south to north, the Gulf of Slides, Tuckerman Ravine, the ravine of Raymond Cataract, Huntington Ravine, the Great Gulf (with branches: the Clay Ravine, Jefferson Ravine, Madison Ravine); on the north of the Northern Peaks are Bumpus Basin, the valley of Snyder Brook, King Ravine, the Ravine of the Castles; on the west of Mt. Washington Burt Ravine and the Ammonoosuc Ravine; on the southwest Oakes Gulf. Some of these 'ravines' as they are called in the usage of the region are properly cirques. This is true of most of those of chief botanical interest, in which the steep cliffs of the headwalls often furnish moist outcrops favorable for the presence of a varied flora (*cf.* the article by J. W. Goldthwait on 'Glacial Cirques near Mt. Washington' in *Am. Journ. Sci.* 4 ser., **35** (1913), 1–19, with three photographs of characteristic cirques, King and Tuckerman Ravines). Goldthwait believes these cirques antedate the continental ice-sheet. The Presidential Range as a whole, from Gorham to Bartlett, is about 22 miles in length.[2]

11. The Dartmouth Range extends southwest from Jefferson Notch in Low & Burbank Grant to Mts. Dartmouth (3750) and Deception (3720). The range is almost completely wooded (an exception is the small summit of *Pine Peak* (2800)). With this range may also be grouped Cherry Mt., a ridge running north and south in the township of Carroll, and reaching a height of 3600 feet.[3]

12. Of low elevation but great botanical interest is a range in Lancaster, running east and west and comprising Mt. Prospect (2059), Mt. Pleasant (1952), and Mt. Orne (1816).

13. The low range of Dalton Mt. (reaching 2169 feet) extends northeast and southwest through the town of Dalton.

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[1] From Mt. Resolution an important branch of this ridge diverges to the southeast into Carroll County.

[2] *Geol. of N. H.* **1**, 187.

[3] *Geol. of N. H.* **1**, 191–192.

Other scattered heights are, of course, found in various parts of the County.

Soils of Coös County.

Contributed by W. O. Crosby.

In the absence of manifold data, such as chemical and physical analyses, soil maps, etc., we cannot undertake the classification and valuation, agriculturally or botanically, of the soils of so considerable an area as Coös County. Apparently, therefore, the best treatment of this topic will consist of a general geological classification of soils, with brief indication of such types as find distinct or important development in northern New Hampshire.

Geologic Classification of Soils.

At the outset we may advantageously follow the lead of Professor George P. Merrill, in his classic work on "Rocks, Rock-weathering and Soils," where he differentiates, in the make-up or structure of the earth's crust, the solid rocks, known collectively as the *bed-rock*, and the overlying unconsolidated material, which he designates collectively the *regolith* (blanket-stone).

The best definition of the regolith is that which regards it as a general synonym of soil. But since soil is commonly used in a far more restricted and superficial sense, it is well to retain the more comprehensive term, regolith, as covering all the materials which on exposure to air and light suffice for the nourishment and growth of plants. In other words, the regolith may be conceived as made up of potential soils, or as the raw material of soils.

Even in its most comprehensive sense, the soil mantle or regolith is not, like the bed-rock, a universal feature, else the bed-rock would be nowhere exposed to observation and study. The regolith varies in thickness or depth from nothing on the bare bed-rock of the mountains and hills to tens of feet on the valley slopes, scores of feet on the lowlands and hundreds of feet on the coastal plain, these estimates holding especially for New England and only in a very general way for the continent.

Regarding the distinction of regolith and soil, Professor Merrill says further: "The extreme upper, most superficial portion of the regolith, that which affords food and foothold for plant life is commonly designated as soil; that immediately underlying the

soil, and passing into it by insensible gradations, is known as the subsoil. This last differs from the soil proper only in degree of compactness and in such chemical changes as may have been induced in the soil through growing organisms and more extensive weathering. Indeed, the soil is but derived from the subsoil, and were it entirely removed, would shortly be replaced through the same agencies as first gave it birth."

We are concerned now with the natural subdivisions or classification of the regolith; and the primary consideration concerns its genetic relations to the bed-rock. In its relations to the bed-rock the regolith or comprehensive soil must be either *sedentary* or *transported*. The regolith is sedentary when it can truly be said to have originated on the area where we now find it, and transported when it has reached its present *locus* by some mode of transportation.

The sedentary portion of the regolith consists chiefly of residual deposits due to the decay or rotting of the bed-rock *in situ* by processes of decomposition (chiefly chemical) and disintegration (chiefly mechanical). The resulting soil is, essentially, the insoluble residue of the rock decay and grows or increases in thickness downward, the superficial part being the oldest and the most complete or typical soil. It is vastly abundant and important in the southern States and in low latitudes generally, and was so, no doubt, in higher latitudes including all New England, in preglacial times. But it was swept away by glaciation and thus became one class or division of transported soils. The normal constituents of the residual soils are chiefly clay, the most important final product of rock decay, and quartzose (siliceous) sand and gravel.

The sedentary soils not residual in origin are those due to the accumulation under favorable conditions, as in the stagnant water of swamps and ponds, of partially decayed vegetation in the forms of peat and muck and swamp soils generally. The soils of this class owe their origin to the presence on the areas of their accumulation of sufficient standing or stagnant water to prevent the complete oxidation of the vegetable tissues. But with them, also, must be included the tests of diatoms which, being siliceous, are subject neither to solution nor to oxidation, and by their accumulation give rise to more or less extensive and pure deposits

of diatomaceous earth or tripolite; and the calcareous tests or shells of a large variety of mollusks, both fresh-water and marine, the resulting calcareous marls being for a large part of New England the only free source of lime in the soils.

For this somewhat diversified group of soils Professor Merrill has proposed the general designation *cumulose deposits*. This term seems, however, rather unfortunate, since a tendency to accumulate is more or less characteristic of all soils; while their organic origin distinguishes this group absolutely from all other soils. We will, then, recognize the sedentary soils as embracing the residual deposits and the organic deposits; the former admitting of subdivision in accordance with the nature of the parent formation or bed-rock type—argillaceous and arenaceous; and the latter, obviously, in accordance with the chemical nature of the predominant organisms—carbonaceous, calcareous, and siliceous.

The great division of the regolith embracing the transported soils is, naturally, subdivided in accordance with the nature or mode of action of the transporting agent, which is in every instance some phase or mode of gravitation, either gravitation acting directly (talus deposits) or through the agency of air (aeolian deposits), water (alluvial deposits), or ice (glacial deposits). The action of gravitation is most obvious and direct for what Professor Merrill calls the *colluvial deposits*, including talus and cliff débris and the material of avalanches. But since colluvial means simply a mixture, and much if not most of the material shed by cliffs is homogeneous and not an apparent mixture of different kinds of rock, *talus deposits* appears to be a more accurately descriptive designation of this group of soils.

Professor Merrill recognizes a two-fold division of the typical talus: a steeply sloping, stony and soilless upper portion and a more gently sloping soil-bearing lower portion, merging with the soils of the lower slopes and the valley floor. Among the striking characteristics of the talus deposits are: the angularity of the material, the lack of assortment, and the very open, well-drained structure of the mass.

In striking contrast to the talus deposits, due to the direct action of gravitation, are the aeolian deposits, consisting of wind-blown materials (sand and dust). These have their most inter-

esting and familiar developments in the sand dunes of ocean, lake, and river shores and of many arid and desert regions.

Cultivation has exposed to the sweep of the winds and to aeolian transportation the soils (chiefly fine sand and silt) of fields and, notably, of well-traveled dirt roads, involving in some cases, no doubt, appreciable transfer of the elements of fertility from field to field and tract to tract. It is probable, however, that the wind has also played an important part in the formation of the loess, and that we find here the most impressive of the aeolian deposits. To realize this we need only to reflect that during the recession of the great ice-sheet vast expanses of sand and silt, unprotected by vegetation, were exposed to sun and wind.

We turn next to the important division of the alluvial deposits, including all those due to the transporting agency of water, in streams and waves, and including also the aqueo-glacial deposits or those made by streams flowing from glaciers. In fact, sedimentary deposits of every kind and description find classification here, including all pond and lake deposits, the flood-plains of rivers, and all marine and coastal-plain deposits. But in such a region as Coös County it is chiefly the aqueo-glacial deposits of the great Ice Age, commonly designated modified drift, and the flood-plains of modern rivers that must be considered.

For the glacial deposits, the fourth and last division of the transported soils, the agent of transportation was glacial ice, including especially the great ice-sheet of Pleistocene time; and the product is the true or unmodified glacial drift, including the ground moraine and all more special and localized forms of morainal material, such as the drumlins. The specially distinguishing features of this most abundant and widespread type of drift and most important of all northern soils are the absence of assorted and stratified structure and the large proportion of incorporated clay and quartz flour, whence the familiar designation, *bowlder clay*, though *till* is the more technical or purely geologic term.

The foregoing geologic classification of soils may be graphically summarized as follows:

The regolith or comprehensive soil	Sedentary	Residual soils—Residuary clays, sands, and gravels, especially characteristic of hot and humid climates.
		Organic soils—Peat, muck, and swamp deposits generally, including also diatomaceous earth and marl.
	Transported	Talus soils—Talus deposits and all cliff débris, including the material of avalanches.
		Aeolian soils—Wind-blown dust (loess) and fine sand (dunes), both recent and glacial.
		Alluvial soils—All alluvium or water-laid (sedimentary) deposits formed in running or standing water.
		Glacial soils—Ground moraine and all unwashed (unmodified) glacial drift or bowlder clay.

General Geologic Relations of the Soils.

With the exception of the organic group (peat, marl, etc.) the soils have their ultimate sources in the decay—disintegration and decomposition—of the bed-rock, near or remote. A review of the important class of transported soils, supremely important for the glacial latitudes, suffices to show to how slight an extent these soils are derived from or reflect the character of the immediately subjacent bed-rock. They are, in fact, strikingly contrasted in this respect with the equally abundant residual soils of the South. It will, nevertheless, be a matter of interest to note the varying character of the bed-rock, the distribution of each type, and the general relations of bed-rock and soil. For this purpose the bed-rock types may be generalized, the northern part of Hitchcock's geological map of New Hampshire being, thereby, greatly simplified.

Northern New Hampshire, including the White Mountains and Coös County, is a complex of igneous and metamorphic rocks, the latter division comprising, chiefly, sedimentary formations which have been more or less profoundly altered (crystallized) by the intrusion of the igneous rocks, chiefly granites and traps.

Following is Hitchcock's schedule of the geological formations of this part of the State. In the accompanying map, for the purpose of this study, it has seemed advisable or permissible to combine the formations. This great condensation of topics, especially for the igneous rocks, is justified by the considerations

that from the point of view of soil derivation rock structure is of no significance and the essential contrasts in composition are not great. Also, some of the types occur so sparingly or in such limited areas as to forbid representation on the small scale of the map (Text-fig. 2).

Igneous Formations

Granitic Group

Conway granite
Albany granite
Chocorua granite
Granite porphyry
Granite, unclassified

Gneissic Group

Lake gneiss
Bethlehem gneiss
Porphyritic gneiss

Basic Group

Sienite
Diorite

Metamorphic Formations

Montalban Group

Muscovite schist and Concord granite
Fibrolite schist
Andalusite schist

Coös Group

Staurolite slate
Argillaceous mica schist
Quartzite and limestone

Mica-schist Group

Merrimack schist
Rockingham schist
Kearsarge schist

Calciferous Group

Calciferous mica schist

Lisbon and Lyman Groups

Phyllite and metamorphosed slate

Cambrian Group

Clay slate

Glacial (Drift) Formations

Till or bowlder clay
Modified drift

Modern Formations

Flood-plains of the rivers
Swamp and bog deposits

Descriptions of Soils.

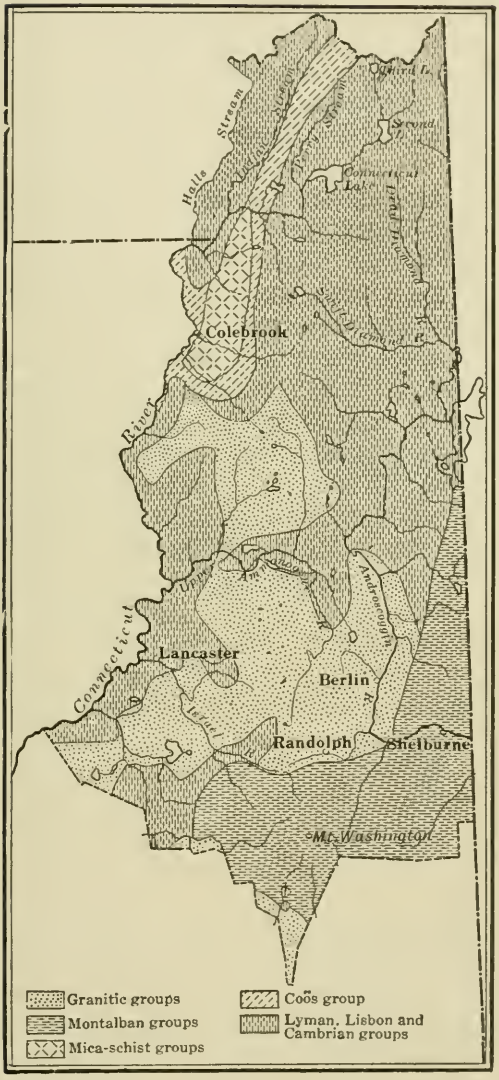
We may now enumerate, briefly, the distinctive features of these numerous terranes and the soil characteristics of each.

Conway granite.—A coarsely granular reddish aggregate of quartz, feldspar (orthoclase), and black mica (biotite). The mica is subject, on oxidation of its ferrous iron, to hydration and consequent expansion. This swelling of the mica has the disruptive effect of the freezing of water in the pores of a stone, causing the more or less complete disintegration of the granite, and to a much greater depth than frost now penetrates, showing that the process is, primarily, chemical rather than physical. A finely gravelly soil is the immediate result. But this disintegration must favor the chemical decomposition or complete decay of the granite, thus yielding in the course of time a true residuary soil and liberating the notable amount of potash and the small but important trace of apatite (calcium phosphate), the chief elements of fertility contained in the granite, which tend to be retained as permanent constituents of the soil and thus contribute to the growth of many successive generations of plants. Goodrich Falls, in Jackson, affords probably one of the most striking examples of the disintegration and decay of the Conway granite, aptly termed, "la maladie du granite", but there are many others.

Albany granite.—The Conway granite is the dominant type, constituting much more than half of the total granitic area. The Albany granite is finer-grained than the Conway granite, and is also somewhat porphyritic in texture. It differs in composition also, in that a part of the biotite of the Conway granite is here replaced by hornblende, a harder and more stable mineral. The elements of fertility are undoubtedly about the same, but the marked tendency to granular disintegration is wanting. Apparently the Albany granite holds the relation of a contact or border zone to the Conway granite.

Chocorua granite.—This type differs from the Albany granite very much as that does from the Conway granite, especially in composition, as all of the biotite is here replaced by hornblende; and the soil relations are undoubtedly similar, the soil-production in post-glacial time being slight or practically nothing.

Granite porphyry.—Some of the New Hampshire porphyries are quite certainly effusive, representing surface flows of acid lava;



TEXT-FIG. 2.—Soils of Coös County.

but we have reference now to the massive granite porphyry and quartz porphyry occurring as the uppermost part of the contact zone of the great granite batholith, which is throughout of related chemical composition. As soil producers the porphyries are quantitatively unimportant, yielding slowly to the elements.

The gneisses.—These formations, of which three divisions are recognized and named by Hitchcock, are chiefly laminated or gneissoid phases of various types of granitic rocks; and their soil relations are undoubtedly similar, soil derivation from such hard and durable terranes being a time-consuming process to such a degree that we are able to cite few if any post-glacial examples. In content of lime, potash, and phosphorus they are found by analysis to be essentially one with the granites.

Sienite and diorite.—These relatively basic rocks are proved by analysis to be much richer in lime and soda and poorer in potash than the granites. The phosphorus was not determined, but whether high or low matters little since these rocks are but rare occurrences, and this is true also of the diabase, diorite, and other basic and ultra-basic features of Coös County geology.

Montalban terranes.—This most highly metamorphic member of the metamorphic formations consists chiefly of schists in which muscovite or white mica largely predominates, and fibrolite schist and andalusite schist. Irregular intrusions of Concord or muscovitic granite and pegmatite are very characteristic. This is one of the hardest, most resistant, and most durable of all the White Mountain formations, and the one, therefore, of which a large majority of the higher summits are formed, including the Presidential and Carter-Moriah Ranges. Consisting almost entirely of well-nigh indestructible minerals,—quartz, acid feldspar, muscovite, fibrolite, and andalusite,—woven in a tough and structureless mesh, it is not surprising that the soils derived from this group of strata are meager and poor. They are mainly such as are afforded by the Concord granite and associated pegmatite or giant granite. The pegmatite, owing to its coarse and irregular crystallization, is subject, more or less, to disintegration by frost action. Also, it is characterized by a greater variety of accessory minerals, including phosphates, than any other White Mountain formation.

Coös terranes.—This formation, named for the County in which, chiefly, it occurs, is described as consisting, in the main, of staurolite schist, wrinkled and argillaceous, gritty mica schist and quartzite, and dark-weathering siliceous and fossiliferous limestone (Lower Helderberg). This formation is broadly developed in Vermont and Canada, forming a continuous series from Lake Memphremagog to the Bay of Chaleur; and the calcareous members yield a notably fertile soil.

Mica-schist terranes.—Assembled here are three great formations of mica schist occurring chiefly in the southern half of the State. These are the Merrimack, Rockingham, and Kearsarge schists, which are all alike conspicuous by their absence in Coös County and hence not factors in the development of its soils.

Calciferous terrane.—Under this general term we range chiefly the calciferous mica schist of the Connecticut Valley, very broadly and continuously developed on the Vermont slope, but only in a few widely separated patches on the New Hampshire side, with but a single limited area within the limits of Coös County. This is the Colebrook and Pittsburg area, approximately sixteen miles in length and one-fourth as wide, as mapped. This formation is not only important because of its extent, but also from the point of view of the present study, since it possesses in its impregnating and interlaminating calcareous constituent (calcium carbonate) a source of unusual fertility for this mountainous region. In its make-up it is a normal, easily eroded mica schist impregnated and seamed with calcareous material and alternating with more or less definite layers and bands of impure, siliceous limestone. The broad zone of this formation lying to the northwest of Coös County, in Vermont and Canada, has undoubtedly contributed by glacial erosion and transportation to the fertility of the Coös soils.

Lisbon and Lyman terranes.—Phyllites (semimetamorphic slates), siliceous and chloritic, and ranging in color from gray to green. These are the dominant formations of Coös County, covering almost the entire northern half of the County. Dixville Notch is in the Lyman group; and for both groups the topography is characteristically smooth and the soil mantle heavy.

Cambrian group.—This formation embraces the clay slate of Cambrian age holding approximately the same relation to the

Lyman and Lisbon groups that these do to the true mica schists, such as the calciferous. In other words, it is only slightly metamorphic. Also, it is only in small part within the limits of Coös County; although the entire area is so located that glacial drift from it must be widespread over Coös. Its lack of intense metamorphism is, of course, favorable to soil production by any erosive process.

Glacial terranes.—The till or bowlder clay, the direct product of the disrupting and rasping mechanical action of the great ice sheet in its progress across the land, is the most nearly universal of all the formations contributing to the soils of Coös County. It fails as a surface formation only where the bed-rock actually outcrops or the till is covered and concealed by the modified drift or later deposits.

The till is normally a heterogeneous mixture of bowlders, cobbles, gravel, sand, and clay; and the common name, bowlder clay, seems to imply that bowlders and clay are the dominant, as they certainly are the most striking and distinctive constituents. Analysis shows, however, that these are the least abundant ingredients of normal bowlder clay, the chief component being the rock flour or impalpably fine sand, the finest product of the glacial mill, which is, normally, from 40 to 50 per cent of the whole, while of the true clay, plastic and yielding combined water on heating, there is only 10 to 12 per cent.

The rock flour is seen under the microscope to be nearly pure quartz, and hence it is commonly called, also, quartz flour. It shows beyond question that in the excessively fine grinding, under the tremendous pressure of the ice sheet, the rocks were reduced chemically as well as mechanically. The quartz alone remains unchanged, while the complex silicates which we know as the feldspars, micas, hornblendes, etc., are broken up chemically, with liberation of the protoxide bases (lime, alkalies, etc.) so essential to the fertility of the soil. To a considerable extent, no doubt, these elements of fertility still exist hermetically sealed in the till. This is especially true of the sands of varying grades, since these, being coarser, yield more slowly than the rock flour to the process of alteration to which the lasting fertility of the upland soils of New England is so largely due.

We thus learn that the ice sheet did much more for this region

than to encumber the surface with bowlders for the construction of enduring field-walls; for it gave the whole country side a deep subsoil plowing that was, no doubt, badly needed; and, more than that, it tore and gouged and rasped from the surface of the bed-rock an immense volume of fresh material, the greater part of which was in the forms of rock flour and fine sand, and thus far more available than it otherwise would be for the permanent deep enrichment of the land.

The trend of glacial movement in Coös County was southward and south-southeastward, thus crossing obliquely the several irregular geologic zones embracing (see the map) the wide band of calciferous mica schist, the Coös group, the Lyman, Lisbon, and Cambrian groups, and the highly complex granitic and Montalban groups. It is a natural but erroneous thought that material wrested by the ice from a particular zone will be spread somewhat evenly over the country to the southward.

We must distinguish here superglacial till and englacial till from subglacial till. The first and second are interesting in various aspects, but the latter only is quantitatively important, especially in regard to the distance covered by the ice and its burden, amounting in extreme cases to hundreds of miles. Rock débris securely planted on or in the ice of the continental glacier was reasonably sure of a long journey; but the subglacial drift is mainly dragged and not carried by the ice and its transport is mostly short. It is, therefore, probably within bounds to say that 90 per cent of the till or ground moraine on any area taken at random, is of local origin or within, say, a mile or two of its parent ledges.

The till is not, therefore, quite such a complete mixture of the rocks of the region as might be supposed; although everything to the northward of a given area is likely to be represented in the till resting on that area. Undoubtedly glaciation has tended to unify the regolith; and it will, no doubt, be long ere this effect is exhausted.

The modified (washed and stratified) drift floors more or less deeply and widely the principal valleys and especially those of low gradient. Deposited by the streams and subsequently extensively eroded by the same agency, the residuum of the modified drift exists as a system of terraces of varying elevation. The

coarseness of the drift in the terraces varies directly as the strength of the current by which it was deposited, the extreme range being from bowlders to clay. Wherever the glacial waters were impounded normal delta structure was more or less probable, beginning with clay and the finest flour in the horizontal bottomsets, followed by fine, medium, and coarse sands in the forward sloping layers of the foresets, and these by the coarse, gravelly, horizontal layers of the topsets, back of which comes, normally, the esker or winding ridge of coarse gravel and cobbles marking the course of the glacial stream by which the esker was built. Glacial lakes and deltas are especially characteristic of areas of northward drainage, the glacial water being impounded by the margin of the ice sheet. Also, tributary streams were dammed by the glaciers of the main valleys.

The modified drift is omitted from the map for the obvious reason that it is almost universally present in the larger valleys and on the lowlands generally, and also because the scale of the map is too small for the accurate delineation of the narrow fringing deposits.

Modern terranes.—It is probable that the extensive erosion of the deep deposits by which the valleys were clogged on the recession of the glaciers was accomplished while the ice still occupied the higher valleys and the streams were in almost constant flood. In other words, only the lowest terrace or modern flood-plain may be regarded, in general, as strictly or entirely postglacial in origin. Delta deposits and structures are almost wholly wanting here; and the deposits of the rivers, as in their meanders they swing from side to side of their valleys, are practically confined to gravel on their beds and to sand and silt on their flood-plains. The gradual shifting and renewal of the flood-plain must tend, as with the annual increment of the flood-plain of the Nile, to maintain its fertility.

From the deposits of running water, we pass to the consideration of those formed in standing waters,—ponds and lakes. The most important of these are organic products or at least may be described as the product of organisms. Mention has previously been made of some of the most important of these, including peat, marl, and tripolite; and including also, though not of interest as soils, bog ores of iron and manganese.

Examples of Soils.

Referring to the general geological classification of soils, we may now note those types of which examples are to be found in Coös County.

Residual soils.—The best examples are afforded by the Conway granite. Nearly every outcrop or bowlder of this granite is a more or less striking example of the disintegration due to the hydration and consequent expansion of the black mica (biotite). But it may be doubted if there is anywhere in this region a finer illustration than that at Goodrich Falls. Good illustrations are afforded, also, by the great pegmatite dikes of the Montalban group, the coarse and irregular crystallization of which makes it susceptible to disintegration by differential expansion and contraction. A good example of the decayed pegmatite is well exposed on the Boston and Maine Railroad near the foot of Pine Mountain and the Mount Madison Spring. With all of these granular rocks, frost completes the work begun by water and alternating wet and dry conditions. The slaty rocks of the Lisbon and Lyman groups are similarly affected by successive exposure to wet and cold conditions; and so to some extent with the schists, although they are less pervious and more waterproof than appearances suggest.

Organic soils.—The organic soils of vegetable origin, peat and muck, are too abundant and wide-spread for extended comment here, for few ponds and lakes are wholly devoid of these deposits and many bodies of standing water have been completely obliterated by them. Forming under conditions favorable to the accumulation of imperfectly oxidized organic matter, we have realized here more or less completely the conditions of coal-formation; and these materials are seen to play a far more important rôle as fuel than as soil. Also it may be noted that they are especially characteristic of northern and glaciated latitudes.

Turning now to the diatomaceous earth or tripolite, we may note that, just as with peat, it is more or less characteristic of all our northern ponds, usually underlying the peat. Hitchcock notes its occurrence in the following towns in Coös County and in many others: Stark, Cambridge (Lake Umbagog), etc., and some of the deposits are three feet or more in depth. Hitchcock is unable, however, to cite more than one deposit of marl in Coös

County. This is in Lime Pond, in the town of Columbia. The pond is approximately 100 by 50 rods, with a maximum depth of at least 15 feet. Although not available as a soil, this marl, if sufficiently abundant, should prove a valuable fertilizer.

Talus soils.—We take account here of innumerable local deposits, the normal cliff débris; but the most notable contributions to this section are made by the slides and landslips, the scars of which blaze the mountains far and near.

Aeolian soils.—For this group, so far as known, no examples are available. On the shores of our lakes and rivers, where, conceivably, sand dunes might be developed, vegetation has the upper hand and we find peat bogs instead. Dirt roads are narrow and verdure-walled, and cultivated fields, from which the winds might gather dust, are few and small. Also, the inconstancy of the winds as to both direction and force is unfavorable to the formation of special deposits of either sand or dust.

Alluvial soils.—These are distinctively the modern flood-plain deposits of both lakes and streams, and vary in extent and importance with the magnitude of the water-body. The material is chiefly sand and silt; and notable deposits are to be found only on the flood-plains of the larger rivers. In a broader but fair sense, however, we may include here the modified drift, which, although previously transported by ice as a part of the till, has in the later stages of its history been transported and deposited by water and may, therefore, be classed with the true alluvium, which embraces practically all the washed and stratified valley drift.

Glacial soils.—We are interested here solely in materials transported and deposited by ice, the true till or bowlder clay, but best known here as the ground moraine, or true drift as distinguished from the modified or water-laid drift. From this point of view all of the Coös soils are local and unimportant, save only those that are directly or indirectly of glacial origin; and these include only the unmodified drift or till, the well-nigh universal upland soil, and the modified or washed and stratified drift, the vastly important lowland or valley soil. In the South a similar duality exists, save that in the place of the unmodified drift or till we have the broad mantle of residual soil.

Climate.

The features of the climate of Coös County to be here especially noted are temperature, precipitation, sunshine, and wind. In the account by J. H. Huntington[1] of the climatology of New Hampshire charts are presented showing the annual isothermal lines (opposite p. 124) in the State and (opposite p. 126) the lines of equal summer temperatures (isotherals) and equal winter temperatures (isochimenals), from which it would appear that the annual isotherm of 42° F. passes through Shelburne, Gorham, Randolph, and Carroll; that of 41° through Success, Berlin, Milan, Kilkenny, Stark, Lancaster, Jefferson, and Whitefield; that of 40° through Cambridge, Errol, Dixville, Erving Location, Columbia, and Stratford; while the summit of Mt. Washington lies as a sort of island enclosed by the isothermal line of 25°.[2] The isotheral line of 65° (nearly corresponding to the isochimenal of 19°) traverses Shelburne, Gorham, Randolph, Jefferson, Lancaster, and Whitefield; that of 63° (nearly corresponding to the isochimenal of 17°) Success, Berlin, Milan, Dummer, Stark, Stratford, and Northumberland; that of 62° (which runs a little north of the isochimenal of 16°) through Errol, Dixville, and Colebrook; while for the summit of Mt. Washington the corresponding summer line represents 47°. (The isochimenal line for Mt. Washington is not stated in the text and is very obscurely printed on the chart.) Mean monthly temperatures given by J. H. Huntington (pp. 144–145) for localities in the County are:

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[1] *Geol. of N. H.* **1** (1874), 119–145.

[2] W. Upham (in *Geol. of N. H.* **1**, 326–327) remarks that "in no other part of the Northern Hemisphere, except north-eastern China, does the isothermal line, which represents the mean temperature of our state, sink so near to the equator—that is, our average temperature is unusually low for the latitude . . . our mean temperature is what might be expected were our geographic position five degrees farther north" (*i. e.*, as far north as the Bay of Islands in Newfoundland, central Anticosti, the Lake of the Woods, or Vancouver).

Month	Shelburne	Stratford	Whitefield	Mt. Washington	Hebron, Labrador[1]
Jan.	16.3	13.3	22.5	6.4	6.0
Feb.	19.3	17.2	16.3	6.9	5.5
Mar.	27.4	24.9	24.2	9.7	5.1
Apr.	39.8	37.4	43.6	22.6	18.9
May	52.1	50.8	53.2	33.3	31.6
June	62.9	61.4	64.5	44.5	36.8
July	69.4	65.2	67.6	47.9	44.6
Aug.	64.2	62.3	62.4	50.7	46.9
Sept.	55.5	54.5	57.7	39.3	41.3
Oct.	43.8	42.2	43.4	29.8	32.0
Nov.	33.3	31.4	31.4	16.5	23.1
Dec.	20.2	16.1	21.7	5.4	6.0
Year	42.0	39.8	42.4	26.1	27.9
No. of years of observation	6 yrs., 9 mos.	13 yrs., 4 mos.	1 yr., 7 mos.		7 yrs.

More recent figures which follow are taken from the U. S. Department of Agriculture, Weather Bureau, *Climatological Data* (New England Section), 33 (1921), 52 (for the year 1921):

	Berlin	Pittsburg
Jan.	16.8	14.0
Feb.	17.9	12.2
Mar.	35.7	32.2
Apr.	46.8	44.0
May	54.7	51.9
June	60.8	58.4
July	72.4	69.4
Aug.	63.0	60.2
Sept.	59.0	59.0
Oct.	46.4	44.2
Nov.	29.4	27.4
Dec.	16.4	14.0
Year	43.3	40.6

For 1919 (*id.* 31 (1919), 101) the annual mean temperature at Berlin was 45.6; at Pittsburg 39.2.

Of maximum and minimum temperatures the following exam-

[1] Added for purposes of comparison. The figures represent averages for the years 1905–1911, and are taken from A. P. Coleman, *Northeastern Part of Labrador and New Quebec*, 9 (*Canad. Dept. of Mines, Geol. Surv. Mem.* 124 (1921)).

ples may be cited, minimum temperatures being enclosed in brackets:

Month	White-field (1870)[1]	Strat-ford (1870)[1]	Berlin (1919)[2]	Berlin (1921)[2]	Pittsburg (1919)[2]	Pittsburg (1921)[2]	Mt. Wash-ington (1870–1871)[4]
Jan.	52	42					
	(−12)	(−12)					(−45)
Feb.	46	44					
	(−12)	(−12)					(−59)
Mar.	55	54					
	(−17)	(−18)					(−4)
Apr.	78	72					
	(20)	(25)					(4)
May	84	86					
	(31)	(33)					(15)
June	92	92					
	(51)	(48)					
July	92	98					
	(50)	(52)					
Aug.	89	89					
	(37)	(40)					
Sept.	82	86					
	(37)	(35)					
Oct.	71	70					
	(16)	(20)					
Nov.	58	58					(0)
	(12)	(12)					
Dec.	45	44					(15)
	(−18)	(−12)					
Year	92	98	93	98	91	93	(−59)
	(−18)	(−18)	(−18)	(−21)	(−26)	(−33)[3]	
Range	110	116	111	119	115	126	

The length of the growing season is also, of course, much influenced by the length of time between the last killing frost of spring and the first of autumn. Figures for Pittsburg[5] are:

	1919	1921
Last killing frost in spring	29 June	16 June
First killing frost in fall	5 September	16 September

[1] *Geol. of N. H.* **1**, 143.

[2] *Climatological Data*, **31** (1919), 101; **33** (1921), 50.

[3] The lowest recorded in the State for the year 1921.

[4] *Mount Washington in Winter*, (1871), 340.

[5] *Climatological Data*, **31** (1919), 100; **33** (1921), 53.

In a town as elevated as Randolph summer frosts are not rare, and a few years ago in each of the summer months occurred a frost sufficiently severe to kill beans and squashes in the gardens. Naturally the higher mountains are more exposed to frosts, for, as Huntington remarks,[1] although in calm winter weather the temperature in the valleys falls lower than at some much higher elevations, yet in stormy and windy weather the reverse is true, and there is a gradual decrease of temperature according to height, amounting to about 1° of temperature for every 354 feet of altitude. C. H. Hitchcock well declares[2] that the climate of Mt. Washington corresponds with that of middle Greenland at about 70° north. The summit is thus "an arctic island in the temperate zone."

The rainfall of the State in general is considerably in excess of the normal amount for its latitude,[3] and the particularly low temperatures of the northern and elevated portions of the State cause "the condensation of a large amount of moisture from the warm south and southwest winds, inducing a more abundant rainfall than could be looked for in our latitude."[4] In some parts of the County, also, easterly storms of considerable duration are accompanied by abundant precipitation. Statistics available as illustrative of these assertions appear on p. 73.

During the same year in which these data were obtained on Mt. Washington (Oct. 1871–Sept. 1872) the total rainfall in other parts of the State varied from 35 to 46 inches (40 inches at Stratford and at Lunenburg, Vermont). It should be noted that in the case of Mt. Washington the figures show the greatest rainfall during the growing season (June to September).[5] Huntington observed[6] that although winter rains were not common on the summits of our high mountains yet every third year they appeared to be much more frequent than during the intervening winters.

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[1] *Geol. of N. H.* **1** (1874), 125–126.

[2] In *Mount Washington in Winter*, (1871), 32.

[3] Upham in *Geol. of N. H.* **1**, 326, who well discusses (326–330) the practical effects of the large rainfall.

[4] *Id.* 327.

[5] *Cf.* L. H. Harvey, *A Study of the physiographic Ecology of Mount Ktaadn* (in *Univ. of Maine Studies*, **5** (1903), 27).

[6] In *Geol. of N. H.* **1**, 133.

Snowfall, in Inches

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
Stratford (1868) [1]	26.5	5.0	8.1	16.1									55.7
(1869) [1]	10.5	54.0	19.5	1.3	4.5					7.0	6.0	24.0	126.8
(1870) [1]	35.3	42.5	11.0							2.5	11.5	17.0	119.8
Whitefield (1870) [1]	22.5	28.2	17.6								14.8	11.4	94.5
Berlin (1919) [2]													66.0
(1921) [2]													70.2
Pittsburg (1919) [2]													120.0
(1921) [2]													143.3

Rainfall, in Inches

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
Stratford (1856–66) [3]													40.0
(1868) [1]	2.6	0.5	2.3	2.9	4.0	3.6	1.8	5.9	5.5		6.9		36.0
(1869) [1]	1.0	5.4	3.6	2.6	3.9	4.4	2.4	3.2	3.4	7.8	2.2	2.2	42.1
(1870) [1]	4.1	5.2	3.5	2.2	2.5	1.6	2.5	3.9	1.4	4.5	4.3	1.7	37.4
Whitefield (1870) [1]	2.2	5.1	4.4	1.9	1.7	4.6	2.5	3.6	0.4	2.7	4.8	1.1	35.0
Berlin (1919) [2]													42.0
(1921) [2]													31.0
Pittsburg (1919) [2]													45.3
(1921) [2]													35.2
Mt. Washington (1871–72) [3]	1.7	0.3	0.8	0.7	4.6	18.5	3.6	6.3	9.6	6.1	3.5	0.8	[4]55.8

[1] *Geol. of N. H.* **1**, 142–143. On the effects of frost upon the White Mountains *cf. Mount Washington in Winter*, (1871), 285-292; J. H. Huntington in *Geol. of N. H.* **1** (1874), 130–132.

[2] *Climatological Data*, **31** (1919), 101; **33** (1921), 50.

[3] *Geol. of N. H.* **1**, 141; ten-year average.

[4] This is the total given in the tables, in which the decimals are carried out to two places.

Harvey has pointed out[1] that frequency as well as amount of rainfall is significant in its influence upon plant growth. I have found no exact figures on this subject for Mt. Washington, but for lowland points in the County the following are illustrative.[2]

	Rainy days	Clear days	Partly cloudy	Cloudy
Berlin (1919)	116	212	55	98
(1921)	146	108	127	130
Pittsburg (1919)	154	140	62	162
(1921)	155	118	54	123

The much greater frequency and longer duration of cloudiness on the higher peaks of the White Mountains is notorious, and J. W. Dawson remarks[3]: "When the summer mists roll around the summit of Mt. Washington, it is in every respect the precise counterpart of an islet anywhere on the coast of America from Cape Breton to the Arctic seas."

The final principal climatic factor, namely wind, is indirectly of great importance to plant life in its interrelation with the other factors just mentioned; as a direct and separate factor it becomes of especial interest only in the exposed regions of high elevations, in connection with the growth and development of scrub. The observations taken by the winter party on Mt. Washington in the winter of 1870–1871[4] gave the following maximum wind velocities in miles per hour:

Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May
72	105	100	98	89	89	63

In December, 1881,[5] the maximum velocity on Mt. Washington reached 170 miles per hour. These great velocities are usually limited to winter and to periods when there are clouds upon the mountains, and may occur when there is complete calm at the base.[6] The effects of the wind upon vegetation will be discussed later.

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[1] *Op. cit.*

[2] *Climatological Data*, **31** (1919), 101; **33** (1921), 50.

[3] In *Canad. Naturalist and Geologist*, **7** (1862), 93–94.

[4] *Mount Washington in Winter*, (1871), 340; *cf.* also 293–300; J. H. Huntington in *Geol. of N. H.* **1** (1874), 134–135 (with diagram), who states that the greatest velocity up to that time measured on Mt. Washington was 140 miles per hour.

[5] Harvey, *op. cit.* 24.

[6] *Geol. of N. H.* **1**, 134. On one occasion, when there was a wind of 96 miles

Floristic Conditions.

Any brief description of the flora of an area as large as Coös County must necessarily be inadequate, (1) from the difficulty of so subdividing the different habitats as to permit the characterization of *typical* plant-associations (as distinct, on the one hand, from associations found in particular localities, and, on the other, from groupings so extensive and composite as to correspond to no single plant-society occurring in Nature), and also (2) from the impossibility of selecting as a basis of classification any one principle which will prove acceptable to all students, irrespective of whether they assume as their primary criterion humidity, chemical or physical composition of the soil,[1] life zones based upon temperature or altitude,[2] amount of sunshine,[3] stages of forest growth, or various combinations of two or more of these elements. Zonation in the White Mountain vegetation was definitely recog-

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at the summit, 2677 feet below, at the railway station, there was not enough wind to move the anemometer. A. K. Chittenden (*Forest Conditions of northern New Hampshire*, (1905), 63) states that data taken by the Weather Bureau indicate an increase of 9 or 10% in wind velocity per 100 feet increase in altitude.

[1] *Cf.* the résumé by H. C. Cowles in *Bull. Am. Bur. of Geogr.* **2** (1901), 165–166, who points out that Unger in 1836 emphasized the distinction between calcareous and siliceous soils on the basis of their chemical composition and hence their food value, while Thurmann in 1849 called attention to the physical structure of different kinds of rock, distinguishing between 'eugeogenous' rocks (which disintegrate into a 'pelogenous' or rich soil) and 'dysgeogenous' rocks (which form a 'psammogenous' or drier and more sterile soil). Warming in 1895 accepted both views but thought the physical the more important. Cowles further notes (p. 168) that mechanical erosion produces soils similar in constitution to the parent rock, while chemical erosion may lead to soils quite different in character. A recent very full discussion of the literature bearing upon the physical and chemical theories (in which, with due recognition of the importance of the former, the greater burden of opinion seems to favor the latter) is given by H. St. John, *A Botanical Exploration of the North Shore of the Gulf of St. Lawrence* (Can. Dept. of Mines, *Memoir* 126 (1922), 28–41, with an ample bibliography).

[2] *Cf.* the well-known views of C. H. Merriam (*Proc. Biol. Soc. Wash.* **7**, (1892), 1–64; *Nat. Geogr. Mag.* (1894), 229–238; *Year Book U. S. Dept. of Agr.* (1894), 203–214; *Bull. U. S. Biol. Surv., No.* 10 (1898): *Life Zones and Crop Zones of the U. S.*; also the caution in regard to the use of these zones given by Fernald in *Rhod.* **22** (1920), 92–93; **23** (1921), 169.

[3] Or light intensity; *cf.* Harvey, *op. cit.* 19.

nized by Rev. Manasseh Cutler in 1784, who describes three zones: "1st covered with a thick growth of wood; 2nd with mosses and a variety of other small vegetables; the 3rd, above the limits of vegetation, covered 10 or 11 months in the year with snow" (*Life, Journals, and Correspondence of Rev. Manasseh Cutler*, 2 (1888), 273). Further, Jacob Bigelow (in *N. E. Journ. of Med. and Surg.* 5 (1816), 332) recognized: (1) the region of forest trees, up to 4000 feet; (2) a region of dwarf evergreens, 4000–5000 feet; (3) an alpine region of 5000–6225 feet; and most subsequent writers, though differing in their figures, have accepted the same classification; *e.g.*, S. H. Scudder (in *Geol. of N. H.* 1 (1874), 337): (1) mountain forest (=Canadian); (2) subalpine scrub (=Hudsonian); (3) alpine rocks (=Labradorian or subarctic); G. M. Allen (in *Proc. Manchester Inst. of Arts and Sci.* 4 (1903), 38–53). The Canadian and Alleghanian faunas, in particular, were early distinguished by L. Agassiz (in Nott and Gibbon, *Types of Mankind* (1854), lxxviii, and map; *cf. Geol. of N. H.* 1 (1874), 332).

The classification here employed is frankly artificial rather than strictly logical, and makes no pretension to exhaustiveness, yet I hope that by means of it one who is familiar with the species involved may be helped to visualize the more characteristic types of vegetation in the County. As elsewhere in this work, somewhat disproportionate attention is given to the Presidential Range, for it is chiefly upon it that we find conditions differing from those common to much of northern New England and eastern Canada.

For purposes of general classification, then, I shall employ two main divisions into (1) habitats essentially natural, *i.e.*, entirely or very largely unaffected by human action, and (2) habitats more or less modified by man, with several subdivisions under each of these headings.

I a. Primaeval evergreen forest, chiefly of *Picea rubra* but with a considerable element of *Abies balsamea*, originally covered most of the hills and mountains, as well as very considerable areas at lower altitudes. The frequent occurrence of the name 'Black Mountain'—even retained on hills now completely denuded—is due to an original growth of spruce, and older descriptions of various parts of the County, recollections of old inhabitants, the frequent and large spruce stumps yet to be seen in the

woods, and occasional large piles of sawdust bear eloquent testimony, in their different ways, to the same fact. Lumbering operations continued through many years and, much more effectively, the cutting of pulp-wood have so destroyed the original growth that extensive primaeval forests of soft wood are now to be found only (a) at heights, mostly above 4000 feet, where the small size of the trees renders them economically unimportant; (b) in places thus far immune by reason of their inaccessibility; (c) in forest reservations, such as the White Mountain National Forest, the New Hampshire State Forest, and reservations of the Appalachian Mountain Club, the Society for the Protection of New Hampshire Forests, and certain summer hotels. Conditions have greatly changed since the publication of A. K. Chittenden's *Forest Conditions of northern New Hampshire* in 1905 (and the colored map therein with its indication of forests still standing), destruction having been greatly accelerated of late years. A good photograph of typical virgin-spruce forest is given by Chittenden (pl. 4, fig. 1). It seems not unlikely that *Pinus Strobus* may once have been much more abundant than at present, inasmuch as it was one of the first trees to be culled by settlers, at a time when spruce was apparently little valued, but its original abundance is hard to determine, and its occurrence in primaeval growth is, within our limits, rather rare. Its growth in this County was further limited by its failure to ascend to any considerable elevation above the sea. Chittenden (*op. cit.* 54) says that it was found at nearly all situations in New Hampshire below 1500 feet. Instances of pines at higher altitudes than that may still be found in Coös County, but the best development is unquestionably at lower levels, in spots usually accessible and hence early cut, our trees being mostly of second growth. A large specimen, perhaps of first growth, is to be found near the Mountain View House in Whitefield, as I am informed by Mr. Walter Deane. Large pines seem early to have been found in the Atkinson & Gilmanton Academy Grant, the *Geol. of N. H.* 1, 580, mentioning one as 7′ 4″ in diameter at the butt, 3′ 1″ at 90 feet from the butt, and scaling 12,000 feet. The woods in which *Picea rubra* predominates[1] extend through the so-called 'Canadian' zone,

[1] Chittenden (*op. cit.* 25–29) describes this type of forest, with statements of its ingredient trees, and from him is derived the account in J. W. Harshberger's

diminishing in size and gradually yielding to *Abies balsamea* as the scrub growth on the mountains (see below) in the 'Hudsonian' zone is reached. Characteristic and frequent in them are the following species: *Thelypteris Phegopteris, T. spinulosa*, var. *americana, Lycopodium lucidulum, Clintonia borealis, Betula lutea, B. papyrifera*, var. *cordifolia, Ribes lacustre, Pyrus americana, Oxalis montana, Acer spicatum, Viola incognita, V. renifolia, Chiogenes hispidula, Linnaea borealis*, var. *americana*, and *Solidago macrophylla*, while more occasional are *Streptopus amplexifolius, S. roseus, Epipactis repens*, var. *ophioides, Habenaria obtusata, Listera cordata, Monotropa Hypopitys, Pyrola minor*, and *Galium kamtschaticum*, with *Amelanchier Bartramiana* and *Viburnum pauciflorum* at the higher levels or in colder glens. The late E. B. Cook, a careful observer, informed me of two trees of *Thuja occidentalis* upon Durand Ridge, Mt. Adams, at an altitude of about 3500 feet. My attempt to find them proved fruitless, the region having been severely deforested. This species reaches 2800 feet on Mt. Ktaadn (Harvey, *op. cit.* 36).

The upper forest passes, as already stated, into the 'scrub' or 'Krummholz' growth of the Hudsonian zone, in which the stature of the trees is gradually reduced. **Abies balsamea* largely replaces the *Picea rubra* of the Canadian forest,[1] and is itself accompanied by **Betula papyrifera*, var. *cordifolia* and *Pyrus americana*. Chittenden (*op. cit.* 31) reckons the extent of scrub

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Phytogeographic Survey of North America, (1911), 374, but Harshberger unfortunately fails to recognize (p. 375) the leading part played in the scrub by *Abies balsamea*, stating that "*Picea nigra* gradually degenerates till it becomes 'Krummholz.'" Much of value on the distribution of the forest trees will be found in Chittenden's work (pp. 52-61), though some of his statements as to distribution need modification.

[1] This fact, familiar to all careful observers of the White Mountain flora, is overlooked by Harshberger; *cf.* the preceding note. This altitudinal replacement of *Picea rubra* by *Abies balsamea* is paralleled by a similar latitudinal one, for as one nears the northern limit of forest trees *Picea rubra* disappears first, then *Abies balsamea*, and later *Picea mariana, Larix laricina*, and birches and aspens (R. Zon, *Balsam Fir*, Bull. 55 of U. S. Dept. of Agr. (1914), 2). Zon (*op. cit.* 7) further remarks that "conditions on a mountain top, where the prevailing low temperature retards evaporation and helps the condensation of moisture in the air, are similar to those in the swamp, and balsam fir shows much the same development in both places."

* In this and the following paragraphs species of especial frequency in the habitats under discussion are marked with asterisks.

as from 4200 feet up to the limits of tree growth at from 4500 to 5200 feet, according to exposure and gradient. For other estimates see above. A discussion of the very similar situation on Mt. Ktaadn in Maine is given by Harvey, *op. cit.* 33-35, who considers the scrub as an encroachment of the trees upon the alpine mat of heaths, etc., when sufficient humus permits. I cannot accept for our mountains his suggestion (p. 34, and note; *cf.* his statement in *Rhod.* 5 (1903), 45–46) for Ktaadn that in time this encroachment may lead as a climax to a forest cover for the whole mountain. Wind pressure, as I shall suggest below, would surely prevent this; *cf.* J. W. Dawson in *Canad. Naturalist and Geologist*, 7 (1862), 84; C. H. Shaw, in *Plant World*, 12 (1909), 175, who specifically dissents from the theory championed by Harvey and by other ecologists like H. C. Cowles (*Bull. Am. Bur. of Geogr.* 2 (1901), 168 ff.), the latter of whom maintains (*l. c.*) that the vegetation of all hills in a given region, no matter of what rock, tends toward an ultimate common destiny, which in most of the United States is the mesophytic forest. In spite of divergence from the opinion of Harvey on this point I should emphasize the fact that the student of the White Mountain flora may gain much of value from a perusal of his article—much more than from J. W. Harshberger's discussion of the plant formations of the Adirondack Mountains (*Torreya*, 5 (1905), 187–194).

By degrees the scrub forest becomes further diminished in size till at last it is truly prostrate, with **Abies balsamea*, *Larix laricina* (rare), **Picea mariana*, **Betula papyrifera*, var. *minor*, *B. glandulosa* and the var. *sibirica*, and occasional alpine species of *Salix* as the larger growth. No distinct 'timber-line' or even 'tree-line' exists in the White Mountains in the sense in which it is found in many parts of the Alps or the Rocky Mountains, *i.e.*, a point up to which merchantable timber is found and at which the trees, not greatly reduced in size, abruptly end. What is in the White Mountains commonly known as the 'tree-line' is the line at which the arborescent species, already reduced to dwarfed or prostrate shrubs, at last disappear. That this line has no direct connection with mere elevation may be seen from the fact that it differs not a little in altitude between the south and southeast slopes (not merely protected from the stronger winter winds but also more thoroughly covered by protecting snow drifts

accumulated under the lee of higher ridges and peaks) and the exposed northern and western slopes. The accumulation of snow on the lee slopes in the White Mountains was early noted (by J. Belknap in *Trans. Am. Philos. Soc.* **2** (1786), 46). On Mt. Madison and the northwest of Mt. Washington, however, the forest line, according to A. Guyot, is at 4150 feet; on the west face of Mt. Clinton at 4250; at the Ledge above the Halfway House on Mt. Washington at 3900 (S. H. Scudder in *Geol. of N. H.* 1 (1874), 338, who gives a colored map showing the boundaries of what he considers the 'alpine' and 'subalpine' zones, though these do not exactly correspond with the bare area and that of scrub growth; *cf.* also the map in his article in *Appalachia*, 5 (1887), 12). Again, on the same slope there is often a great difference in the height of the tree-line between exposed ridges and sheltered ravines, as may be well seen if one contrast on Mt. Adams the low level which this line reaches on the very exposed 'Knife-edge' of Durand Ridge (*ca.* 4300 feet) with the adjoining valley of Snyder Brook, where scrub ascends as far as the Madison Huts (*ca.* 4800 feet).

C. H. Shaw in *Plant World*, **12** (1909), 169–181, discusses the '*Causes of Timber-line in high Mountains.*' I am gratified to find that convictions which I had formed on this subject long before I learned of Mr. Shaw's article are completely substantiated (in so far as they relate to the White Mountain tree-line) by his reasoning. He also gives a review of other theories of the phenomenon, which have ascribed it to (1) the increase of cold at higher elevations; (2) the shortness of the vegetative season, hindering the production of seed and the growth of new wood; (3) dry killing in winter, under the action of strong winds; (4) miscellaneous causes such as summer frosts, absence of necessary soil bacteria, etc.; (5) excess of snow, lingering late in deep beds. The last of these may well be, as Shaw supposes, the explanation in the case of the very different conditions in the Alps and Rocky Mountains, but on the differently situated and more isolated higher peaks of New England he rightly admits wind as the chief factor in the formation of scrub, concluding (pp. 179–181) that wind tree-lines "are recognized by a gradual and ultimately great reduction in height of trees, by their massing together in dense level-topped societies, thus affording each other mutual protec-

tion, and by the occurrence of the upper outposts of the forest as clumps of dwarfs in local depressions and sheltered spots. Wind cripples are characterized by the fact that shoots which project beyond a critical line are dead or dying, often by the entire loss of their conical form; by their much-branched and condensed habit, and frequently by one-sided growth. The primary condition which the tree must fulfill in order to exist is to develop sufficient foliage within the limitations set by the wind."

Further, *Abies balsamea* is a tree easily thrown by the wind, and, as noted by Chittenden,[1] when it grows in shallow soil the constant swaying of the trunk by the wind causes the breaking of the rootlets and the consequent death of the tree. Let anyone who doubts the importance of wind pressure in determining the tree-line in the White Mountains[2] note the way in which scrub will crouch behind the profile of protecting rocks and in natural hollows into which the full force of the wind cannot penetrate, and how rarely it is found upon any high or exposed sky-line, and further, where any such exposure is found, the very asymmetrical development of branches produced by this factor of wind pressure.

Harvey (*op. cit.*) also observes that the scrub has an ellipsoidal cross-section of trunk, with the longer axis parallel to the prevailing wind (probably resulting from the development of mechanical tissue on the lee side), and great development of bark. Great age is sometimes to be found in scrub trees of small diameter, for the scrub, as distinguished from *Abies balsamea* at lower altitudes, grows very slowly. This may be seen in the slowness with which trails cut through the scrub grow up, but to obtain somewhat more precise information on this point in July, 1923, I made a series of measurements along the Watson Path on Gordon Ridge, Mt. Madison, the results of which are here given. In the upper

[1] *Op. cit.* 53. For a view of the tree-line at the Madison Huts *cf.* Chittenden, *op. cit.* pl. 3, fig. 1; for the tree-line on the southeast side of Mt. Washington the plate in *Geol. of N. H.* **1**, opposite p. 618; *cf.* also Shaw, *op. cit.* 174, and J. W. Harshberger in *Geogr. Rev.* **7** (1919), 238, for scrub near the top of Tuckerman Ravine. Good views of scrub, both waist-high and prostrate, are given by A. K. Chittenden in *Rep. of N. H. Forestry Comm.* 1903–1904, pl. 7, fig. 2; pl. 11, figg. 1–2; Harshberger, *op. cit.* 243; 252–253.

[2] This argument does not, of course, apply in the quite different situations in the Alps and Rocky Mountains; *cf.* Shaw, *op. cit.* 175–181; Rydberg in *Bull. Torr. Bot. Club*, **40** (1913), 677–685.

forest of the Hudsonian zone but a few instances were noted, all of *Abies balsamea*, with the following measurements:

Height in feet	*Diameter in inches (at height of one foot)*	*Number of rings in cross-section*
35	7.0	60
..	6.5	81
22	5.5	63
26	12.0	90

At tree-line, where the trees were already much reduced in height, the following typical cases were found:

Height in feet	*Diameter in inches (at one foot)*	*Number of rings*
12	4.0	52
8	2.0	68
6	1.5	20

Above 4800 feet elevation the firs, exposed to the full force of the northwest wind, were usually less than three feet high and very often essentially prostrate, and the following measurements were obtained:

Diameter in inches (at one foot)	*Number of rings*
2.7	52
4.0	50
0.7	10

In the same area *Picea mariana* grew less rapidly:

Diameter in inches (at one foot)	*Number of rings*
1.2	40
1.2	66
1.0	42
1.0	68

Betula papyrifera, var. *minor* furnished the following figures, all from cases above 4800 feet:

Diameter in inches (at one foot)	*Number of rings*
1.5	26
0.7	8
1.2	15
0.7	14

While these data are too few for exact conclusions it may yet be noted that (1) *Abies balsamea* above tree-line is apparently

shorter-lived than in the more protected Hudsonian forest; (2) that its rate of growth, as indicated by the relation between diameter and the number of rings, is materially slower; (3) that *Picea mariana* is, above tree-line, rather longer-lived than *Abies* and very much slower in its rate of growth; (4) that *Betula papyrifera*, var. *minor* is apparently both much shorter-lived (for the specimens noted were selected as apparently well-matured ones) and much more rapid in growth than either of the other two species examined. Here, as in other respects, a parallelism may be found between mountain conditions and those at lower levels in regions farther north, for, near the northern limit of forest, C. W. Townsend and G. M. Allen (in *Proc. Bost. Soc. Nat. Hist.* 33 (1907), 283) report finding in Labrador 54 rings in the cross-section of a scrubby fir trunk two inches in diameter, whose topmost twig was only 13 inches from the ground. Some of the scrub trees at higher levels in the White Mountains, in places where increase of trunk above ground is difficult, have developed upon their roots wooden growths, from the size of a chestnut to that of a large orange, which are locally known as 'lignoles' or 'White Mountain fruit,' and are sometimes sold as curios to tourists

In the picturesque and miniature forest formed by the scrub, the floor of which is covered by a spongy deep growth of mosses and hepatics very retentive of moisture, are found **Thelypteris spinulosa*, var. *americana*, **Clintonia borealis*, **Maianthemum canadense*, **Streptopus roseus*, *Listera cordata*, **Coptis trifolia*, *Mitella nuda*, **Oxalis montana*, **Cornus canadensis*, **Chiogenes hispidula*, *Pyrola minor*, **Trientalis borealis*, **Linnaea borealis*, var. *americana*, and, in sheltered openings among the scrub, **Lycopodium annotinum*, var. *pungens*, **Ribes lacustre*, **R. prostratum*, **Kalmia angustifolia*, **Ledum groenlandicum*, **Rhododendron canadense*, **Vaccinium caespitosum*, **V. canadense*, **V. pennsylvanicum*, var. *angustifolium*, **V. uliginosum*, var. *alpinum*, **V. Vitis-Idaea*, var. *minus*, **Solidago macrophylla* and its **var. thyrsoidea*. These species, as noted by Harvey in his study of Mt. Ktaadn,[1] are not properly alpine plants, but are also found abundantly at lower levels. *Lycopodium annotinum*, var. *pungens* and *Solidago macrophylla*, var. *thyrsoidea* are, strictly speak-

[1] *Op. cit.* 34.

ing, subalpine modifications of types found at lower altitudes, or perhaps, as Professor Fernald suggests to me, the nomenclatorially typical *Solidago macrophylla* may be a southern derivative of the arctic-alpine var. *thyrsoidea*.

Steep gravelly slopes in the scrub belt, particularly rock and earth slides, are commonly overgrown with dense masses of **Alnus crispa* and **Betula papyrifera*, var. *cordifolia*, two species also often found along the courses of subalpine brooks, and on account of their pliant habit well adapted to the precarious conditions of exposure to avalanches of snow.[1]

I b. The larger rivers (Connecticut, Upper Ammonoosuc, Magalloway, and Androscoggin) are often lined by woods which, though seldom primaeval, may perhaps, when long undisturbed, reproduce fairly well the original forest, such as *Thuja occidentalis* (usually in a narrow fringe just above high-water mark), *Tsuga canadensis*, *Salix nigra*, var. *falcata*, *Juglans cinerea* (Farmer and Moore, *Gazetteer of N. H.* (1823), 202, speak of much of the valley land of Northumberland as originally covered with this species), **Ulmus americana*, *Acer Negundo* (in the Connecticut watershed only), and *A. saccharinum*, while in the alluvial sandy or mucky soil beneath grow **Pteretis nodulosa*, *Osmunda regalis*, var. *spectabilis*, *Equisetum hiemale*, var. *affine*, *E. pratense*, *E. scirpoides* (on dark alluvial banks), *Taxus canadensis*, *Agrostis perennans*, *Asperella Hystrix*, var. *Bigeloviana*, **Dilepyrum erectum*, **Bromus ciliatus*, *B. altissimus* (in our area apparently confined to the Connecticut valley), **Cinna pendula*, *Elymus canadensis*, *E. virginicus*, *Melica striata*, *Oryzopsis asperifolia*, *Panicum clandestinum*, *Poa alsodes*, *Carex Tuckermani*, *Luzula saltuensis*, *Smilacina stellata*, *Smilax herbacea*, **Corylus rostrata*, **Anemone quinquefolia*, *Clematis virginiana*, *Ranunculus septentrionalis*, **Dalibarda repens*, *Amphicarpa monoica*, *Rhus Toxicodendron*, *Celastrus scandens*, *Psedera vitacea*, *Conioselinum chinense*, *Cornus stolonifera*, *Epigaea repens*, *Pyrola rotundifolia*, var. *americana*, *P. asarifolia*, *Viburnum dentatum*, *Helianthus decapetalus*, and *H. strumosus*. The more open parts of the alluvial banks may contain **Calamagrostis candensis*, *Muhlenbergia racemosa*, *Trisetum spicatum*, var. *molle*, *Rosa blanda*, *Apios tuberosa*, *Vitis novae-*

[1] *Cf.* Harvey, *op. cit.* 37.

angliae, Vaccinium caespitosum, Steironema ciliatum, Aster paniculatus, Solidago serotina and its var. *gigantea, S. squarrosa;* while on the river gravels and islands covered at high water are *Deschampsia caespitosa, *Carex torta, *Salix cordata, *S. lucida, Prunus depressa* (only in Shelburne), **Apocynum cannabinum,* and *A. medium. Carex arcta* in wet meadows is found along the larger streams, and *Salix pellita* follows the upper courses of the Connecticut and Androscoggin systems, but does not descend far along them, reaching its southern limits at Dalton on the Connecticut and Errol on the Androscoggin.

I c. The aquatic flora of the County is that which has received, in proportion to its interest, the least attention, and it is consequently difficult to present satisfactory general conclusions. In its richest forms it is found in the warm, shallow, rich-bottomed ox-bows of the Connecticut valley and in occasional lowland ponds such as Cherry Pond and Little Cherry Pond in Jefferson, in which **Pontederia cordata* is the most conspicuous plant, but some of the following also occur: various species of *Sparganium* and *Potamogeton, Najas flexilis, Scirpus acutus, S. subterminalis, S. Torreyi, S. validus, Brasenia Schreberi, Nymphaea odorata, Nymphozanthus microphyllus, N. rubrodiscus, *N. variegatus,* various species of *Myriophyllum, Nymphoides lacunosum, Utricularia minor,* and **U. vulgaris,* var. *americana,* while on the muddy shores appear **Equisetum limosum* and forms, *Typha latifolia, Alisma Plantago-aquatica,* several species and varieties of *Sagittaria, *Glyceria borealis, *Dulichium arundinaceum,* several species of *Eleocharis, *Juncus pelocarpus, Polygonum amphibium* and its f. *terrestre, Drosera longifolia, Hypericum boreale, Ludvigia palustris, *Cicuta bulbifera, Sium suave, Scutellaria epilobiifolia,* and *Utricularia intermedia.* More abundant in ponds with firmer bottoms are **Eriocaulon septangulare* and *Lobelia Dortmanna,* while the strand vegetation of such may include *Lycopodium inundatum, Carex Oederi, Rynchospora capitellata, R. fusca, Ranunculus reptans, Vaccinium macrocarpon, Gratiola aurea,* and *Utricularia cornuta. Spirodela polyrhiza* and *Callitriche palustris* have so far been noted chiefly in very small pools (or the latter on damp ground). Not a few of the larger lakes and ponds have had their levels artificially changed by flooding for

storage, and the draining of the water in dry seasons leaves large areas of mud with much refuse but little natural vegetation.[1]

I d. More or less floating peat bogs surrounding and encroaching upon small ponds[2] are a frequent feature of some parts of the County (though naturally rare among the high mountains with their steep slopes and narrow valleys), and numerous also are the precisely similar but increasingly drier peat bogs which have in many places entirely replaced the little ponds which they originally surrounded. Advancing most closely to the water's edge and along sluggish tributary or outlet streams are **Calla palustris*, **Myrica Gale* and its var. *subglabra*, *Potentilla palustris* and its var. *villosa*, **Chamaedaphne calyculata*, *Bidens cernua;* then there may come a tough and safe but yielding turf mainly composed of **Carex lasiocarpa*, **C. oligosperma*, and *C. rostrata* and its var. *utriculata* (and, in thinner places, **C. canescens*, var. *disjuncta*), interspersed with *Scheuchzeria palustris*, var. *americana*, *Carex lasiocarpa*, *C. limosa*, *C. Michauxiana*, *C. paupercula*, *Rynchospora alba*, *Juncus canadensis*, *Smilacina trifolia*, *Calopogon pulchellus*, *Pogonia ophioglossoides*, **Sarracenia purpurea*, and **Hypericum virginicum*. Farther from the shore the growth becomes less grassy and more bushy, with such low shrubs as **Myrica Gale* and its var. *subglabra*, *Andromeda glaucophylla*, *Kalmia polifolia*, **Ledum groenlandicum*, **Rhododendron canadense*, accompanied by an undergrowth of *Carex pauciflora*, **C. trisperma*, *Eriophorum callitrix*, *E. virginicum*, and **Vaccinium Oxycoccus*. This stage of the swamp is increasingly intruded upon by *Larix laricina* and *Picea mariana*, which, with the aid of taller shrubs (**Pyrus melanocarpa*, *Rosa nitida*, **Nemopanthus mucronata*, **Kalmia angustifolia*, and **Viburnum cassinoides*), form the transition to the surrounding forest.

High peat bogs on some of the secondary mountains (Mt.

[1] *Cf.* A. K. Chittenden, *op. cit.* pl. 2, fig. 2, for a view of such a muddy shore at First (Connecticut) Lake.

[2] On this type of bog *cf.* J. W. Harshberger in *Plant World*, **12** (1909), 34–41; 53–61, who asserts (p. 61) that the low temperature of such bogs—and consequently the presence of arctic species in them—is due to the persistence of winter cold and ice which in so large a non-conducting mass lasts through the summer months. *Cf.* Harvey, *op. cit.* 43–46, for a more detailed account of their characteristic plants; also W. L. Bray, *The Development of the Vegetation of N. Y. State*, (1915), 65; 124–128.

Success, parts of the Carter-Moriah Range, Mts. Clinton and Jackson), often encroached upon by scrubby woods of *Abies balsamea*, *Picea mariana*, and *P. rubra*, have a more limited flora, of which *Eriophorum callitrix*, *Scirpus caespitosus*, var. *callosus*, *Rubus Chamaemorus*, and **Vaccinium Oxycoccus* are the most noteworthy species, with *Comandra livida* in the damp edges of the surrounding scrub. Of these, **Eriophorum callitrix*, **Scirpus caespitosus*, var. *callosus*, and **Vaccinium Oxycoccus* are also to be found in a few alpine peaty bogs upon the higher peaks of the Presidential Range.

I e. Shaded cliffs and rocky talus slopes, such as are to be found at Beaver Falls in Colebrook, the Devil's Slide in Stark, Mt. Prospect in Lancaster, in parts of the Ice Gulch in Randolph, at the Alpine Cascade in Gorham, in parts of Shelburne, and at Hart Ledge in Hadley Grant, may show some of the following species, many of them of southern distribution and found in the County only in these protected localities: *Asplenium Trichomanes*, **Cystopteris fragilis*, **Polypodium virginianum*, *Thelypteris fragrans*, var. *Hookeriana*, *Woodsia glabella*, *Agropyron caninum*, var. *tenerum*, *Asperella Hystrix*, var. *Bigeloviana*, *Sphenopholis pallens*, *Polygonum cilinode*, *P. Douglasii*, *P. scandens*, *Chenopodium Boscianum*, *Arenaria stricta*, *Silene antirrhina*, *Aquilegia canadensis*, *Clematis verticillaris*, *Adlumia fungosa* (perhaps introduced), *Arabis Drummondi*, *A. hirsuta*, *Cardamine parviflora*, *Saxifraga virginiensis*, **Fragaria vesca*, var. *americana*, *Potentilla fruticosa*, *Geranium Robertianum*, *Rhus Toxicodendron* (perhaps a distinct variety, appearing rather different from the forms found elsewhere in the County), *Celastrus scandens*, *Psedera vitacea*, *Vitis novae-angliae*, *Circaea latifolia*, *Epilobium glandulosum*, var. *perplexans*, *Panax quinquefolium*, *Cornus rugosa*, *Satureja vulgaris*, *Galium lanceolatum*, *Viburnum acerifolium*, *Campanula rotundifolia*, *Antennaria Brainerdii*, and *Eupatorium urticaefolium*.

I f. The largest natural open spaces—apart from water surfaces—are presented by the parts of the Presidential Range which rise above the tree-line. Here there is not a little diversity, due, in part, to differences in the moisture of the soil, in part to its constituents, and to the exposure and the degree of disintegration (or resistance to erosion) of the underlying rocks. This last factor is especially emphasized by H. C. Cowles in *Bull. Am. Bur.*

of Geogr. 2 (1901), 165–168; *cf. Bot. Gaz.* 31 (1901), 89–90; G. E. Nichols in *Torreya*, 14 (1914), 184.

The piles of loose rock ('Felsenmeer,' 'fell-field') which constitute a large part of the peaks of Madison, Adams (and its subsidiary peaks), Jefferson, and Washington, support little or no vegetation save occasional small herbs which have sprung up in little pockets of soil on the top of individual rocks, but the greater part of the alpine region is occupied by barrens or tundra,[1] composed of gray rocks interspersed in a dull brownish growth of **Carex rigida*, var. *Bigelowii*, relieved at its lower borders and in protected hollows by prostrate green patches of **Abies balsamea* and **Picea mariana*. Other frequent species of this area are **Carex brunnescens* and **Empetrum nigrum*, with the spots of greater disintegration of rock, and hence more gravelly soil (*cf.* Harvey, *op. cit.* 32–33) showing **Lycopodium Selago*, **Agrostis borealis*, **Poa laxa*, **Juncus trifidus*, **Luzula spicata*, **Salix Uva-ursi*, **Arenaria groenlandica*, **Potentilla tridentata*, **Rhododendron lapponicum*, **Diapensia lapponica*, **Prenanthes Boottii*, **P. nana*, and **Solidago Cutleri*, while of more local occurrence are *Lycopodium sabinaefolium*, var. *sitchense*, *Carex capitata*, *C. scirpoidea*, *Silene acaulis*, var. *exscapa*, *Potentilla Robbinsiana*, *Arctostaphylos alpina*, *Euphrasia Oakesii*, *E. Williamsii*, and *Gnaphalium supinum*.

C. Schröter, *Das Pflanzenleben der Alpen* (1908), 514 (as quoted by Harshberger (in *Geogr. Rev.* 7 (1919), 245), divides the plants of the fell-field into (1) earth-inhabiting; (2) shingle-inhabiting; (3) rock-inhabiting; while Harvey (*op. cit.* 15) considers the ecological development of the similar alpine region on Mt. Ktaadn to be (1) crustaceous lichens; (2) reindeer and Iceland moss formation; (3) alpine tundra; (4) Krummholz; (5) *Picea-Abies* forest; (6) White Pine; (7) deciduous forest; all these stages gradually working upward. Inasmuch, however, as stages

[1] *Cf.* Chittenden, *op. cit.* pl. 2, fig. 1; *id.* in *Rep. of N. H. Forestry Comm.* 1903–1904, pl. 2, fig. 1; also the description of Harvey, *op. cit.* 31–32. Bray (*op. cit.* 77) gives a brief account of the similar but much more limited flora of Mt. Marcy in the Adirondacks, and Harshberger (in *Geog. Rev.* 7 (1919), 239–241) describes it from the point of view of an ecologist (on pp. 241–242 he similarly deals with Ktaadn, and on pp. 234–239 with the 'fell-fields' of Greenland, Iceland, and S. America).

1 and 2 concern plants of a lower scale than those included in the present list, no. 6 is of doubtful application to the Presidential Range, and further encroachment of no. 4 upon no. 3 is uncertain, it has seemed better in my classification (which does not profess to be an ecological treatment) to attempt to describe the more striking existing conditions rather than to assume any particular theories of succession and development.[1]

This range contains no extensive alpine meadows like those which in the Alps receive their moisture from a constant supply of ice and snow. But there are a number of springs and pools at high levels (Madison Spring, Star Lake, Peabody Spring, Storm Lake, Spaulding Spring, McGinley Spring, the springs in the Alpine Garden, the Lakes of the Clouds, etc.) which are surrounded by moist grassy meadows or bordered by wet peaty banks, and somewhat similar conditions are found at the heads of many of the brooks which descend from the range into the cirques, particularly King Ravine, the Great Gulf, Huntington Ravine, Tuckerman Ravine, and Oakes Gulf. The differences of flora between the heads of the V-shaped valleys and those of the cirques is generally noticeable, being probably due, at least in large part, to the presence in the cirques of considerable areas of damp cliffs and other spaces free from trees. In some instances, particularly in Tuckerman Ravine, the species of these habitats descend along the brooks, to the open shelves of steep slopes far below the normal elevation of 'tree-line'; while a few species, such as *Sibbaldia procumbens*, *Angelica atropurpurea*, and *Heracleum lanatum*, do not ascend to the upper levels but are confined to the head walls of the cirques. These species constitute the 'alpestrine meadow societies' of Harvey (*op. cit.* 39–44), who distinguishes three stages: (1) the pioneers in cracks and at the bases of dripping cliffs; (2) the meadow stage, with increasing water in the substratum; (3) the shrub stage, when waste and decay have begun to

[1] The account of our alpine flora in J. W. Harshberger's *Phytogeographic Survey of North America*, (1911), 375–377, is superficial and inaccurate. His list, for example, of 49 plants found in New Hampshire only on alpine summits still includes *Dryas* (!) and contains at least seven species known in the State from lowland localities. More accurate is his description in *Geog. Rev.* **7** (1919), 242–255, with photographs of characteristic fell-fields (pp. 238, 245, 248).

set in sufficiently. This last, according to his view, precedes the encroachment of the mesophytic forest from below, but, as I have already stated, I should prefer to assume for the White Mountains—barring any decided change in climate—a more stable condition in these different zones than does Harvey. In this general group of moist alpine meadow and rill species belong *Agropyron caninum*, var. *Hornemanni*, **Calamagrostis canadensis* and vars. *robusta* and *Langsdorfi*, *C. Pickeringii*, *Deschampsia atropurpurea*, *Festuca rubra*, var. *prolifera*, *Hierochloë alpina*, *H. odorata*, *Phleum alpinum*, *Poa saltuensis*, *Trisetum spicatum*, var. *pilosiglume*, *Carex atratiformis*, *C. brunnescens*, *C. canescens*, *C. capillaris*, *C. debilis*, var. *strictior*, *C. lenticularis*, var. *albi-montana*, *C. leptonervia*, **C. rigida*, var. *Bigelovii*, *Luzula confusa*, *L. parviflora*, var. *melanocarpa*, **Veratrum viride*, *Habenaria dilatata*, *Salix herbacea*, *S. Peasei*, **S. Uva-ursi*, *Oxyria digyna*, *Polygonum viviparum*, **Stellaria borealis*, **Thalictrum polygamum*, *Cardamine bellidifolia*, var. *laxa*, *Saxifraga rivularis*, **Geum Peckii*, *Sibbaldia procumbens*, **Spiraea latifolia*, var. *septentrionalis*, *Viola labradorica*, **V. pallens*, **V. palustris*, **Epilobium lactiflorum*, **E. Hornemanni*, *E. angustifolium*, *E. palustre*, and varieties, *Angelica atropurpurea*, *Heracleum lanatum*, *Cassiope hypnoides*, *Loiseleuria procumbens*, *Phyllodoce coerulea*, **Vaccinium caespitosum*, **V. pennsylvanicum* and its var. *angustifolium*, *Castilleja pallida*, var. *septentrionalis*, *Rhinanthus oblongifolius*, *Veronica alpina*, var. *unalaschcensis*, *Houstonia caerulea*, var. *Faxonorum*, *Lonicera caerulea*, var. *calvescens*, *Campanula rotundifolia*, *Achillea Millefolium*, var. *nigrescens*, *Anaphalis margaritacea*, var. *occidentalis*, *Arnica mollis* and var. *petiolaris*, *Aster puniceus*, var. *oligocephalus*, **A. foliaceus*, **Prenanthes Bootii*, **P. nana*, **Solidago macrophylla*, var. *thyrsoidea*, and *Taraxacum ceratophorum*. Toward the lower borders or under the lee of scrub may be found thickets of *Salix argyrocarpa* and *S. planifolia*.

Distinctively alpine species may occasionally be found at far lower levels. This may occur in cold ravines like the Devil's Hop-yard in Stark and the Ice Gulch in Randolph, where the presence of ice beneath the rocks all through the summer and the protection from the sun's rays produce a cold temperature in which, amid a somewhat scrubby growth of *Picea mariana*, appear

Betula papyrifera, var. *minor*, *Epilobium Hornemanni*, *Vaccinium uliginosum*, var. *alpinum*, and *Viburnum pauciflorum*, and not a few other species, though by no means alpine, are yet common to these valleys and to the scrub at high altitudes. In other cases species normally found at high altitudes appear sporadically, sometimes probably washed down by streams, at moderate elevations and ordinary conditions of temperature, *e.g.*, *Carex scirpoidea* on a railroad track near Crawford's, and *Juncus trifidus* in a similar situation in Randolph; *Geum Peckii* at Thompson Falls in Pinkham Grant, and *Castilleja pallida*, var. *septentrionalis* by the roadside near the entrance to the Crystal Cascade in the same Grant. *Vaccinium Vitis-idaea*, var. *minus* and *Potentilla tridentata*, in fact, reach their greatest development in some of their stations at low levels, as, for example, in the vicinity of Appalachia station in Randolph. The occurrence of *Lycopodium Selago* in a pasture at West Stewartstown, of *Agrostis borealis* in Dartmouth College Grant, of *Calamagrostis Pickeringii* in Lancaster, and of *Arnica mollis*, var. *petiolaris* in Shelburne may also be noted. Similar cases in the distribution of these species occur elsewhere in New England outside of our particular area, especially in northern Maine, where *Castilleja*, for example, is a regular species of river banks.

Conversely, not a few plants, some of them cosmopolitan weeds, occasionally ascend to alpine levels, particularly along the Mt. Washington Carriage Road and the most-used trails. A list of such seems hardly significant, but they will be found noted in their proper places in the accompanying catalogue. *Hieracium aurantiacum* has reached an elevation of 4200 feet on Mt. Pleasant, and it will be of interest to observe whether it will eventually become as ubiquitous in the alpine regions as it has in the meadows and pastures of the lowlands. The appearance of *Larix laricina* as a scrub tree in a few isolated specimens is worthy of passing notice (see the catalogue for eight instances; for its similar appearance on Mt. Ktaadn *cf. Rhod.* 3 (1901), 164, 169).

I shall now discuss those habitats which have been modified by the influence of man, either involuntary or intentional.

II a. *Burned lands.*—Among the larger areas damaged by fire within more recent years may be mentioned the Pilot Range and much of the Upper Ammonoosuc valley, the western part of the

Mahoosuc Range, and the Wild River valley from the Baldface Range to the Carter-Moriah Range, as well as Pine Mountain in Gorham, and areas in Carroll. The year 1903 was particularly destructive in this respect. Fire prevention has since then done much to improve conditions, yet the fire of 1921 on Mt. Madison gives a warning of the ever present danger. Chittenden's map indicates the larger 'burns,' and his plate 6, fig. 1, gives a view of a typical burned area, while plate 7, fig. 1, shows the appearance of such land after ten years of growth (*cf. id.* in *Rep. of N. H. Forestry Comm.* 1903–1904, pl. 30, fig. 2; also the account of J. H. Huntington (in *Geol. of N. H.* 1 (1874), 583–585) of the forest succession after burning). The causes and effects of forest fires in our particular region have been well treated by Chittenden,[1] who also discusses the character of the forest growth which follows such damage.[2] The tree which most quickly occupies the burned area is **Prunus pennsylvanica*, of which as many as 1200 seedlings have been counted in a square rod.[3] Other plants soon appearing are: **Pteridium aquilinum*, var. *latiusculum*, *Rumex Acetosella*, *Corydalis sempervirens* (especially on burned ledges), **Rubus idaeus*, var. *strigosus*, **Epilobium angustifolium*, **Aralia hispida*, *Gaultheria procumbens*, **Vaccinium canadense*, **V. pennsylvanicum* and the var. *nigrum*, **Anaphalis margaritacea*, **Aster acuminatus*, *Erechtites hieracifolia*, var. *intermedia*, *Gnaphalium decurrens*, *Solidago canadensis* and other species of the genus. Soon after there appear **Populus grandidentata* and **P. tremuloides*, several species of *Salix* (especially **S. rostrata*), **Betula lutea*, and **B. papyrifera*, and, in places where there is enough moisture, **Acer pennsylvanicum* and **A. spicatum*. Successive burnings tend to increase the herbaceous element of this flora at the expense of the arborescent.

Open ledges, especially those on the secondary mountains, such as the Percy Peaks, Green Ledge, rocky hills about Berlin, the more open summits of the Mahoosuc Range, Mt. Crawford, etc., are doubtless often due to the destruction of the humus by fires, in some cases so long ago that the traces are now obscure. The Percy Peaks were long ago burned over; Green Ledge, the Pilot

[1] *Op. cit.* 61–76.

[2] *Id.* 50–51; 67–70.

[3] *Id.* 67–68.

Range, the hills near Berlin, North Baldface, Mt. Moriah, Pine Mt., and parts of Mt. Hayes not long ago; the mountains about Crawford Notch about 1803 (Hitchcock in *Geol. of N. H.* 1 (1874), 75–76), and Mt. Crawford about 1815 (*ibid.*). These ledges have, individually, rather small numbers of species, mostly falling—in addition to the usual forest species advancing to the edge of the cliffs—in the following list: *Woodsia ilvensis, Selaginella rupestris, Pinus resinosa, *Agrostis hyemalis, Calamagrostis neglecta, *Deschampsia flexuosa, Muhlenbergia racemosa, Carex aenea, Polygonum cilinode* (especially on the talus of such ledges), *Paronychia argyrocoma*, var. *albimontana, Arenaria groenlandica*, var. *glabra, Corydalis sempervirens, Amelanchier stolonifera, *Potentilla tridentata, Pyrus arbutifolia*, var. *atropurpurea, Empetrum atropurpureum, *Aralia hispida, Arctostaphylos Uva-ursi*, var. *coactilis, *Kalmia angustifolia, *Rhododendron canadense, *Vaccinium canadense, *V. pennsylvanicum* and its *var. *nigrum* (these three much gathered for commercial purposes on some of the mountains named), *V. Vitis-idaea*, var. *minus, Melampyrum lineare, *Solidago Randii.*

II b. The flora of recent cuttings in some respects resembles that of burns, both habitats having in common the sudden admission of intense sunlight where there was previously shade. But though *Prunus pennsylvanica* is also frequent here it is by no means the dominant species that it is in burned lands, and the succeeding forest is much more decidedly influenced by that which preceded, the seeds and young plants of which have not been so thoroughly eliminated as they are by fire. Hardwoods, to be sure, tend to replace conifers, but in the reproduction the proportion of conifers in the new forest growth increases with the elevation and the gradient, just as in the original forest.[1] Noteworthy in cuttings, however, both of conifers and of hardwoods, are a few species which often quickly appear but with the gradual increase of shade do not long persist, such as *Rubus idaeus*, vars. **canadensis* and **strigosus* (particularly well developed in the decaying corduroys and other rotting wood so abundant after logging operations), *Sambucus racemosa*, and **Aster acuminatus.* Along logging and 'tote' roads, where the ground is more clear for herbaceous species than in the adjacent 'slash,' such plants as the

[1] Chittenden, *op. cit.* 46–47.

following have been found, largely introduced in feed for the horses used in logging, and sometimes long persisting: *Avena sativa*, **Calamagrostis canadensis*, *Dactylis glomerata*, **Carex crinita* and its *var. *gynandra*, *Rumex maritimus*, var. *fueginus*, *R. mexicanus*, *Ranunculus repens*, *Geum macrophyllum*, *Melilotus officinalis*, **Trifolium agrarium*, **Zizia aurea*, **Galeopsis Tetrahit*, **Prunella vulgaris*, var. *lanceolata*, *Scrophularia lanceolata*, *Veronica officinalis*, *Artemisia vulgaris*, and *Cirsium muticum*.

II c. Dryish second growth woods of **Populus grandidentata*, **P. tremuloides*, **Betula papyrifera*, **B. populifolia*, **Fagus grandifolia*, **Acer saccharum*, and **A. spicatum* (with occasional *Abies balsamea* and **Picea rubra*) may contain as undergrowth **Pteridium aquilinum*, var. *latiusculum*, **Lycopodium annotinum* and var. *acrifolium*, **L. clavatum*, *L. complanatum* and *var. *flabelliforme*, **L. obscurum*, and var. *dendroideum*, **Carex arctata*, **C. novae-angliae* (especially on banks), **Oakesia sessilifolia*, *Microstylis unifolia*, **Viola septentrionalis*, **Aralia nudicaulis*, *Chimaphila umbellata*, var. *cisatlantica*, *Gaultheria procumbens*, *Pyrola chlorantha*, var. *paucifolia*, **P. elliptica*, **Apocynum androsaemifolium*, **Diervilla Lonicera*, **Antennaria canadensis*, **A. neodioica*, **Aster cordifolius*, *Hieracium paniculatum*, **H. scabrum*, **Lactuca canadensis* and varieties, **Prenanthes altissima*, *Solidago arguta*, *S. caesia*, and *S. juncea*. At the borders of old pastures, partly shaded by woods, many of these species may also be found, as well as the following, which are at home in more sunny openings in the woods, especially in sandy soil: *Lycopodium tristachyum*, *Agropyron caninum*, var. *tenerum*, f. *ciliatum*, *Melica striata*, *Oryzopsis asperifolia*, **Panicum boreale*, *P. xanthophysum*, **Carex communis*, *Lilium philadelphicum*, *Myrica asplenifolia*, etc.

II d. Low or swampy second-growth woods, in soil of no especial richness, will present, under the shade of **Acer pennsylvanicum*, **A. rubrum*, **A. saccharum*, **A. spicatum*, and *Fraxinus nigra*, such smaller plants as **Athyrium angustum*, **Thelypteris Dryopteris*, **T. Phegopteris*, **T. noveboracensis*, **T. spinulosa*, var. *intermedia*, **Osmunda Claytoniana*, **Equisetum sylvaticum*, var. *pauciramosum* and *f. *multiramosum*, **Dilepyrum erectum*, **Bromus ciliatus*, **Cinna latifolia*, **Glyceria melicaria*, **G. nervata*, **Carex arctata*, *C. bromoides*, *C. brunnescens*, **C. crinita* and varieties, **C. Deweyana*, **C. intumescens*, **C. leptonervia*, **C.*

projecta, **C. scabrata* (especially along rills), *C. tenella*, *Arisaema triphyllum*, **Clintonia borealis*, **Maianthemum canadense*, **Medeola virginiana*, **Oakesia sessilifolia*, *Trillium erectum*, **T. undulatum*, *Corallorhiza maculata*, *C. trifida*, *Cypripedium acaule* and f. *albiflorum*, *Habenaria bracteata*, *H. dilatata*, *H. fimbriata*, *H. hyperborea*, *H. macrophylla*, *H. orbiculata*, **Coptis trifolia*, *Chrysosplenium americanum* (in springs and rills), **Tiarella cordifolia*, *Hamamelis virginiana*, *Pyrus americana*, *P. dumosa*, **Rubus pubescens*, *Ilex verticillata* and var. *tenuifolia*, **Nemopanthus mucronata*, **Impatiens biflora*, **Viola incognita*, **V. rotundifolia*, **Circaea alpina*, **Epilobium glandulosum*, var. *adenocaulon*, *Osmorhiza Claytoni*, **Cornus alternifolia*, **C. canadensis*, *Monotropa uniflora*, **Trientalis borealis*, *Lycopus americanus*, *Scutellaria lateriflora*, *Galium asprellum*, **G. triflorum*, *Mitchella repens*, **Lonicera canadensis*, **Viburnum alnifolium*, **Aster acuminatus*, **A. cordifolius*, **A. macrophyllus*, **A. puniceus*, **Prenanthes altissima*, and *Solidago latifolia*.

II e. In old and moist, usually upland, second growth, upon rich soil, in woods predominatingly of **Acer saccharum*, besides the species enumerated in the preceding list there may also be looked for, among arborescent species, **Betula lutea*, **B. papyrifera* and its *var. *cordifolia*, *Ostrya virginiana*, **Fagus grandifolia*, *Fraxinus americana*, and *Tilia americana* (a convenient diagnostic tree by which to recognize rich woods), and of smaller plants *Adiantum pedatum*, **Athyrium acrostichoides*, *Thelypteris Goldiana*, *Botrychium angustisegmentum*, *B. ramosum*, **B. virginianum* (almost always found where the two preceding species grow), *Taxus canadensis*, *Festuca nutans*, *Milium effusum*, *Carex albicans*, *C. cephaloidea*, *C. plantaginea*, *C. platyphylla*, *C. rosea*, var. *radiata*, *Allium tricoccum*, **Erythronium americanum*, *Polygonatum biflorum*, *Laportea canadensis*, *Pilea pumila*, *Urtica Lyallii*, **Claytonia caroliniana*, *Actaea alba*, *A. rubra* and f. *neglecta*, **Ranunculus abortivus* and var. *eucyclus*, *R. recurvatus*, *Caulophyllum thalictroides*, *Sanguinaria canadensis*, *Dicentra Cucullaria*, *Dentaria diphylla*, *Ribes triste*, var. *albinervium*, *Agrimonia gryposepala*, **A. striata*, *Impatiens pallida* and var. *speciosa*, *Viola canadensis*, **V. eriocarpa*, var. *leiocarpa*, **V. renifolia* and *var. *Brainerdii*, **V. Selkirkii* (especially around the roots of maples), *Dirca palustris*, *Circaea canadensis*, *Aralia racemosa*,

Panax trifolium, *Osmorhiza divaricata*, *O. longistylis*, *Sanicula marilandica*, *S. trifoliata*, *Cynoglossum boreale*, **Epifagus virginiana*, and **Eupatorium urticaefolium*. If these woods be also rocky we may often expect **Polystichum acrostichoides*, *P. Braunii*, **Thelypteris marginalis*, *Asperella Hystrix*, var. *Bigeloviana*, *Oryzopsis racemosa*, *Carex anceps*, *C. longirostris*, *C. pedunculata*, *Hepatica acutiloba*, *H. americana*, and *Rubus odoratus*. Such woods as I have described are scarce in the vicinity of the Presidential Range, but common in the Lyman, Lisbon, and Cambrian groups (*cf.* pp. 63–64 above). This forest at places passes for virgin hardwood, but where I have had opportunity of examining it I should rather judge it to be the result of a culling of the soft woods many years ago, which has given the hardwood species a better opportunity for a nearly unmixed growth. This seems to be the view of Chittenden (*op. cit.* 21–24), who describes this type of forest and gives statistics of the size and relative frequency of its chief constituent trees (*cf. id.* 43).

II f. Open meadows and swales contain, in addition to the ordinary introduced grasses, clovers, and weeds, the following characteristic species: **Onoclea sensibilis*, **Thelypteris cristata*, **T. palustris*, **Osmunda cinnamomea*, **Calamagrostis canadensis*, *Glyceria canadensis*, **G. grandis*, **G. nervata*, **Muhlenbergia foliosa*, *Phalaris arundinacea*, *Poa palustris*, *Carex canescens* and vars. **disjuncta* and *subloliacea*, **C. crinita* and *var. *gynandra*, **C. debilis*, var. *Rudgei*, **C. echinata*, vars. *cephalantha* and *angustata*, *C. gracillima*, *C. lenticularis*, **C. leptalea*, **C. lurida*, **C. pallescens*, **C. stipata*, *C. stricta* and vars., **C. vesicaria*, var. *jejuna*, *C. vulpinoidea* (apparently adventive), **Eriophorum viridi-carinatum*, **Scirpus atrocinctus* and f. *brachypodus*, **S. atrovirens*, var. *georgianus*, **S. rubrotinctus*, **Luzula campestris*, var. *multiflora*, *Lilium canadense*, **Veratrum viride*, **Iris versicolor*, **Sisyrinchium angustifolium*, *Habenaria fimbriata*, *H. psycodes*, **Salix cordata*, **S. discolor*, **S. lucida*, **S. sericea*, **Alnus incana*, **Polygonum sagittatum*, *Arenaria lateriflora*, *Caltha palustris*, **Thalictrum polygamum*, **Fragaria virginiana* and the var. *terrae-novae*, *Geum rivale*, *G. strictum*, **Rubus canadensis* and occasional other species, **Impatiens biflora*, **Viola cucullata*, **V. pallens*, **Epilobium densum*, **E. glandulosum*, var. *adenocaulon*, *E. molle*, **Heracleum lanatum*, **Hydrocotyle americana*, **Zizia aurea*, **Lysi-*

machia terrestris, Gentiana linearis (a plant very erratic in its appearance and disappearance; I have seen several acres literally blue with it and a couple of years later at the same spot been unable to find a single plant), **Mentha arvensis* and varieties, **Chelone glabra, Veronica americana* (in rills), *V. scutellata, *Galium asprellum, *G. Claytoni, G. palustre, Campanula aparinoides, Aster paniculatus* (especially near the larger rivers), **A. puniceus, *A. umbellatus, Cirsium muticum, Erigeron philadelphicus, E. pulchellus, *Eupatorium maculatum, E. perfoliatum, Petasites palmatus,* and **Senecio Robbinsii.* Of the weeds it may be here noted that large areas in the County have been ruined by **Hieracium aurantiacum,* and small ones have been almost completely appropriated by *Hierochloë odorata. *Carum Carvi* in its abundance, habit, and habitat corresponds very exactly to *Daucus Carota* in southern New England.

II g. Pastures are occupied in their drier parts by **Dennstaedtia punctilobula, *Pteridium aquilinum,* var. *latiusculum, Botrychium dissectum* and *f. *obliquum, B. simplex* (usually on gravelly soil, such as that of eskers, in company with *Danthonia spicata* and various species of *Polytrichum*), *B. ternatum,* var. *intermedium, *Lycopodium clavatum* and *var. *megastachyon, L. complanatum* and *var. *flabelliforme, Juniperus communis,* var. *depressa* (rare), **Danthonia spicata, *Panicum Lindheimeri* and varieties, **Poa pratensis, Carex umbellata, *Juncus Greenei, Microstylis unifolia, Spiranthes gracilis, *S. Romanzoffiana, *Rubus allegheniensis, *R. canadensis, *R. idaeus,* var. *strigosus, *Spiraea latifolia, *Lechea intermedia, *Viola septentrionalis, *Oenothera perennis, *Vaccinium canadense, *V. pennsylvanicum* and *var. *nigrum, *Prunella vulgaris,* var. *lanceolata, Verbascum Thapsus, *Veronica serpyllifolia, *Houstonia caerulea, *Lobelia inflata, L. spicata* (apparently adventive), **Anaphalis margaritacea, *Antennaria neglecta, *A. petaloidea, *Cirsium arvense* and f. *albiflorum, C. lanceolatum, Gnaphalium decurrens, *Hieracium aurantiacum, H. florentinum* (recently adventive), **Solidago canadensis, *S. graminifolia, *S. nemoralis, *S. rugosa,* and **Taraxacum laevigatum.* In the more boggy spots appear *Carex flava, *C. scoparia,* varieties of *Juncus effusus, Liparis Loeselii, *Salix rostrata, *Spiraea tomentosa, *Hypericum canadense, H. mutilum, *Kalmia angustifolia,* and **Rhododendron canadense.*

Such pastures if unused grow up, through the coming in of **Abies balsamea*, **Picea canadensis* (which attains its best development from Lancaster northward as an old-pasture rather than as a forest tree), **P. rubra*, *Pinus Strobus*, etc., to second-growth forest of the types described in **II c** and **II d** above, with the increasing shade gradually excluding most of the species just mentioned.

II h. The adventive weeds of cultivated fields and roadsides differ little from those found farther south in New England, and since these, together with the various escapes from agricultural and horticultural cultivation, are fully treated in the catalogue it is unnecessary to recount them here. Owing to the fact that the large industries of the County are nearly all concerned with wood products the number of plants adventive in connection with them is far smaller than would be the case were the manufactures more general in character. The chance plants of town dumps (noted in their places in the catalogue) are not here listed, but it may be remarked that in this County the following species are so closely confined to the ballast or immediate vicinity of railroads as to make clear the manner of their introduction: *Eragrostis pilosa*, *Carex Houghtonii*, *Cyperus filiculmis*, var. *macilentus*, **Stenophyllus capillaris*, **Polygonella articulata* (in the southern part of the County), *Chenopodium capitatum*, *C. leptophyllum*, var. *oblongifolium*, *Salsola Kali*, var. *tenuifolia*, **Mollugo verticillata*, *Spergularia rubra*, *Conringia orientalis*, *Lathyrus pratensis*, *Petalostemum candidum*, **Linum usitatissimum*, *Euphorbia corollata*, *E. glyptosperma*, **E. hirsuta*, *Viola fimbriatula*, **Linaria canadensis*, *L. minor* (recently becoming common), *Campanula divaricata*, *Ambrosia psilostachya*, *Artemisia biennis*, *A. ludoviciana*, *Grindelia squarrosa*, and *Helianthus subrhomboideus* (on this and other species *cf. Rhod.* 11 (1909), 30; 13 (1911), 103). The Grand Trunk Railway, with its large shipments from the West, is responsible for not a few of these adventive species. At the farthest extreme from the primaeval flora lie two species (*Sagina procumbens* and *Galinsoga parviflora*) known in the County only as weeds in flower-pots and tubs of laurel trees!

At this point it may be noted that, despite an increase in population from 30,753 in 1910 to 36,093 in 1920 (*Fourteenth Census*, 3 (1922), 629), this County is reverting at a rapid rate to wildness,

as may be gathered from the following figures from the same census (6 (1922), 124): the number of farms has decreased from 1895 in 1900 to 1761 in 1910 and 1441 in 1920, and the improved land in farms from 124,786 acres in 1900 (out of a total land area of about 1,150,720 acres) to 93,201 in 1910 and 90,530 in 1920. The percentage of land area (improved and unimproved) in farms diminished from 23.8 in 1910 to 20.6 in 1920, though as a partial offset the percentage of improved land in the farm areas increased from 34.1 in 1910 to 38.1 in 1920. These tendencies are not peculiar to Coös County, for in the State as a whole (p. 115) the area of improved land decreased from 2,251,488 acres in 1850 to 702,902 in 1920, and the percentage of farm land improved decreased during the same period from 66.4 to 27.0. All this seems to indicate that, outside of the fertile area from Colebrook northward and the valleys of the larger streams, most of the County is economically better adapted to the growth of forests than to farming. The increases in population have, of course, been urban, not agricultural.

To discuss the effects upon the flora of different soils in various parts of the County, though obviously an important matter, would be extremely difficult on account of the lack of sufficiently detailed soil maps and of data accompanying specimens. J. W. Dawson (in *Canad. Naturalist and Geologist*, 7 (1862), 94) had observed that some of the most distinctive White Mountain alpine plants are definitely calcifuge, but the subject has been more recently developed in detail in a noteworthy article by M. L. Fernald on *The soil preferences of certain alpine and subalpine plants* (*Rhod.* 9 (1907), 149–193), who clearly differentiates three distinct alpine floras found upon potassic, calcareous, and magnesian rocks. Inasmuch as our mountains belong entirely to the first-named group, as recognized by Fernald (p. 171), having their affinities in soil and also in flora with the Adirondacks, the highest peaks of the Green Mountains, Ktaadn, Abraham, and other bare mountains of Maine, and with Mt. Desert Island and other exposed parts of the Maine coast, we may be here pardoned for not attempting a detailed subdivision of the soil relations found upon them, data for which are hardly available. A few points, however, taken from the observations of E. T. Wherry (in *Rhod.* 22 (1920), 37–39) may be here summarized.

The underlying rock is dominantly mica gneiss, with granite intrusions and quartz veins. In the spruce-fir forest (*i. e.*, the Canadian zone), sub-acid in reaction, ericaceous plants are infrequent, save for *Chiogenes hispidula* and *Vaccinium canadense*, but at about 3900 feet the soil is blacker and more acid, the conifers are smaller, and ericaceous plants more abundant. Above the tree-line in the autogenous black humus, or alpine peat, with mediacid reaction, very many of the *Ericaceae* are found, but on the more bare and exposed rocks near the summits, crumbling, and with subacid reactions, of that family only *Rhododendron lapponicum* is able to live. Minimacid soil is found only in springy places, free from ericaceous growths, and characterized by such plants as *Habenaria dilatata*, *H. obtusata*, and *Castilleja pallida*, var. *septentrionalis*. One district, however, is sufficiently unlike the rest of the County to merit exceptional attention, namely the area of calciferous mica schist[1] extending from near the village of Pittsburg southward through Clarksville, Stewartstown, Colebrook, and the northern part of Columbia. Its gently sloping hills are characterized by soil of great fertility, a larger proportion of which is under cultivation than in other less fertile parts of the County. The ponds (*e. g.*, Ladd Pond in Stewartstown and Lime Pond in Columbia) and some of the smaller sloughs tend to be marly in character, and cedar-swamps (elsewhere in the County almost entirely lacking) occupy many of the hollows. Rock outcrops, as at Beaver Falls in Colebrook, contain species of great interest, and the upland woods are uniformly rich in vegetation. In the following list are given some of the species most characteristic of the district, those apparently not found anywhere else in the County being marked by a dagger (†): †*Cryptogramma Stelleri*, *Cystopteris bulbifera*, *Equisetum pratense*, *Potamogeton alpinus*, †*P. obtusifolius*, †*P. praelongus*, †*P. Vaseyi*, †*Carex Bebbii*, *C. conoidea*, *C. diandra*, *C. flava* (found at various other places but far more abundant in this area), †*C. gracillima*, var. *humilis*, †*C. interior*, *C. Oederi*, †*C. polygama*, †*Eleocharis intermedia*, †*E. nitida* (the only stations yet known in New England), †*Scirpus acutus*, †*S. pauciflorus*, †*Juncus brachycephalus*, †*J. Dudleyi*, †*J. nodosus*, *Stellaria uliginosa*, *Viola nephrophylla*, †*Halenia deflexa*, *Satureja vulgaris*, †*Galium Claytoni*, var. *sub-*

[1] *Cf. Geol. of N. H.* **1** (1874), opp. 548 for a map.; also p. 63 above.

biflorum, †*Lobelia Kalmii*, and *Petasites palmatus*. The cedar-swamps contain, under a more or less dense growth of *Thuja occidentalis* (here more abundant and generally distributed than elsewhere in the County), *Carex trisperma*, †*Symplocarpus foetidus* (known from only one station), *Habenaria obtusata*, *Listera auriculata*, †*Microstylis monophyllos*, *Moneses uniflora*, and *Pyrola secunda*, var. *obtusata*.

An area which might be expected to yield some species not found elsewhere in the County is situated[1] in the extreme northeastern part of Pittsburg, a few miles southwest of Crown Monument, where there are said to be large beds of serpentine. Elsewhere, as in various places in Europe, and in America at Mt. Albert in Gaspé, in the asbestos district of Thetford, Quebec, near Mt. Orford, Quebec, and in northern Vermont, serpentine has been found to exhibit a peculiar flora. In the case of this particular area its inaccessibility has thus far prevented botanical exploration.

The number of species and varieties thus far known only from the Connecticut watershed is about 97, of those known only from the Androscoggin watershed about 50; but it should be borne in mind that both the greater area and the peculiar calcareous district described help to swell the former number, and that further collections in both basins will undoubtedly reduce these numbers, which are, therefore, to be regarded as merely provisional.

Plants of southern distribution reach the County by two principal gateways: the valleys of the Connecticut and the Androscoggin; and it is in the towns situated lowest upon these streams that the greatest number of such species is found. Thus Shelburne contains a considerable number of species not elsewhere known in our area, and a dozen species are practically limited (in the County) to Shelburne in the one valley and Dalton and Lancaster in the other. The Shelburne flora is much more southern in character than that of Dalton or Lancaster, which lie much farther distant (along the river) from the sea. In Lancaster the most noteworthy station for such is on Mt. Prospect. Small enclaves of southern species are found also farther north, as on the east side of Head Pond in Berlin (*Rynchospora capitel-*

[1] C. H. Hitchcock in *Geol. of N. H.* **1** (1874), 25.

lata, *R. fusca*, *Myrica asplenifolia*, and *Arctostaphylos Uva-ursi*, var. *coactilis*) and on the talus protected by the high cliffs of the Devil's Slide in Stark. Indeed, there is very great likeness, almost identity, between the northern boundary of these southern species and the isothermal line of 50° for April, May, and June (as shown on a colored map in the *Geol. of N. H.* 1, 574), which Professor Verrill had proposed as a boundary between the Canadian and Alleghenian birds. W. F. Flint[1] considered 600 feet of altitude as the most convenient boundary between the Canadian and Alleghenian zones of plants, and pointed out that on the western edge of the State this line is most strikingly formed by the Fifteen Mile Falls on the Connecticut, the head of which is in the southern part of Dalton.

Some southern species ascend the valley of the Saco and are found on its slopes in Hadley Grant, but the summit of Crawford Notch, like that of Pinkham Notch (each about 2000 feet in elevation) proves an effective barrier to their northward extension.

To calculate the percentages in our entire flora (the affinities of the alpine flora will be discussed below) of plants of northern and of southern distribution would not only be a difficult task but would give no fair picture of the flora as a whole, since rare and local species would count equally with omnipresent ones. From what has been said, however, it should be obvious that the primaeval forest of the uplands is Canadian in character, and such indications as are available suggest the same for the lowlands. It should be recalled that, as noted above, the lowest elevation in the County (the Androscoggin River at the Maine line in Shelburne) is 713 feet above the sea, and that by far the larger part of the County is apparently too high (or too cold) for *Quercus borealis* (see the data for that species in the catalogue). The penetration of the Canadian area, then, by species of predominantly southern range has been very largely limited to narrow strips running not very far up the valleys of the two chief rivers (for such finger-shaped intrusions of southern types *cf.* Ashe in *Journ. Elisha Mitchell Sci. Soc.* 37 (1922), 198, n. 18).

As one ascends to higher levels the northern affinities of the flora become, of course, more clearly apparent. The flora of the

[1] In *Am. Naturalist*, **11** (1877), 90; *Rep. of Forest Comm. of N. H.* (1885), 31.

alpine region of the Presidential Range has been compared, in respect of identity of species and of general character, with that of the Labrador coast in the vicinity of Hopedale. Former extravagant statements occasionally made asserting the presence here of a large number of endemic species rest upon little foundation, inasmuch as the only ones at present to be considered as endemic are *Salix Peasei*, *Geum Peckii*, *Potentilla Robbinsiana*, and *Houstonia caerulea*, var. *Faxonorum*, the first probably a local hybrid, the second and third (also found upon the Franconia Range and thus endemic to the White Mountains rather than to this County) nearly related to other boreal or alpine species found elsewhere. Possibly *Euphrasia Williamsii* should also be listed as endemic, but since a variety of it has been found in Newfoundland it has seemed more conservative to omit it from this list. Further investigations of the alpine flora of eastern Canada may at any moment reveal even these species there, and leave the White Mountains with no endemics at all. In fact, several species originally supposed to be endemic to the White Mountains, such as *Calamagrostis Pickeringii*, *Carex lenticularis*, var. *albi-montana*, *Carex rigida*, var. *Bigelovii*, *Scirpus cespitosus*, var. *callosus*, *Betula papyrifera*, var. *minor*, *Euphrasia Oakesii*, and *Prenanthes Boottii*, have been found to have a much wider range.

For the presence in our alpine area of this essentially boreal or arctic element the explanation is to be sought in the glacial history of the region. The explanation of the phenomena which is here adopted was suggested by E. Forbes (in *Mem. Geol. Survey of Great Brit.* 1 (1846), 336–432, especially 345 ff.), accepted by Charles Darwin in the *Origin of Species* (ch. 12, pp. 330–333 of the 1887 ed.), by J. D. Hooker (in his noted *Outlines of the Distribution of Arctic Plants*, in *Trans. Linn. Soc. London* 23 (1861), 253–254), by Asa Gray (in a review of Hooker's article in *Am. Journ. of Sci.* ser. 2, 34 (1862), 144–148), W. F. Flint (in *Geol. of N. H.* 1 (1874), 392–393), and very commonly by later writers (*e. g.*, C. C. Adams in *Journ. of Geogr.* 1 (1902), 308–310; Rydberg in *Bull. Torr. Bot. Club*, 41 (1914), 90–91). As applied to the similar conditions obtaining upon Mt. Ktaadn this theory is conveniently summarized by L. H. Harvey in *Univ. of Maine Studies*, 5 (1903), 12–14.

Earlier scientists, notably Sir Charles Lyell (*Second Visit to the United States of North America*, 1 (1849), 80–84) and J. W. Dawson (in *Canad. Naturalist and Geologist*, 7 (1862), 90–91), supposed that during a subsidence of this part of the continent in an earlier geological period the White Mountain peaks were left as islands to which the seeds of arctic plants were brought by the agency of birds and other animals and, still more, by floating icebergs. With the subsequent rising of the land these species were cut off from their arctic relatives by the intrusion of plants from the warmer south. This theory has been completely supplanted by the glacial one outlined below. Equally unlikely is the view of M. S. Bebb (*Bull. Torr. Bot. Club*, 17 (1890), 150–151) that the presence of *Salix herbacea* on our mountains is due to its wind-borne seeds, for this explanation, in itself difficult, would not explain the presence here of various other members of our alpine society (but *cf.* W. L. Bray, *op. cit.*, 80–81).

The Pliocene period saw a more or less uniform circumpolar flora, but in the Pleistocene the southward-moving ice-sheet drove this flora before it. The New England mountains, whose tops were covered by the ice sheet, were early chilled and their floras were forced to retire to the plains, mingling with the arctic species migrating southward, for all species were compelled to migrate or else suffer extinction. After a long period, the ice, which had extended as far south as New Jersey, retreated; the mountain peaks, because of their snowfall, perhaps became the centers of temporary local glaciers.[1] The arctic plants followed the retreating ice to the mountains, where some ascended the exposed slopes and summits in temperatures suitable for them, while others continued northward on the lowlands, still following the retiring ice, to their present arctic homes. We thus get in the case of mountains, as is well known, by means of increase of altitude the same results which are found in the arctic regions by increase of latitude. Thus in the catalogue of plants collected by A. P. Coleman in 1915 at Hebron and neighboring localities in northern Labrador (see his *Northeastern Part of Labrador and New Quebec* (1921), 53–56) 68 species are

[1] That the great cirques on the Presidential Range were formed after the retreat of the ice sheet, as has often been thought, is denied by Goldthwait in *Am. Journ. Sci.* 4 ser. **35** (1913), 1–19.

listed, of which 23 are characteristic plants of our alpine area and several others are found with us at lower altitudes. The list of plants collected by R. H. Wetmore (*Rhod.* 25 (1923), 4–12) in the much less boreal conditions about Hamilton Inlet, Labrador, contains 195 native species and varieties, of which 125 (64%) occur in Coös County (10% of the remainder being maritime). In H. St. John's list of the vascular plants of the north shore of the Gulf of St. Lawrence (Can. Dept. of Mines, *Memoir* 126, (1922), 56–114) out of 614 species, varieties, and forms 61% are known from Coös County, and of the remaining 39% about one-third are maritime and hence not to be expected in our area. Of the 72 alpine White Mountain plants listed a little below, 43 (about 60%) are given in St. John's list, and others occur farther north in Labrador. Further, the flora of the interior of the country north of the Gulf of St. Lawrence is definitely likened by W. A. Stearns (*Proc. U. S. Nat. Mus.* 6 (1883), 126; quoted by St. John, *op. cit.* 2) to that of the summits of the White Mountains.

Parallel to the case of the plants is that of the fauna, certain species of which are as closely localized in the alpine regions as are any of the species of plants. Thus S. H. Scudder in *Geol. of N. H.* 1 (1874), 339–341, states that the butterfly *Brenthis montinus* and the grasshopper *Pezotettix glacialis* are, in our mountains, limited to the subalpine region and appear in Labrador in the more protected low spruce woods, while the butterfly *Oeneis semidea* is endemic on the alpine summit of Mt. Washington, though other species of the same genus are found on the outer exposed and barren islands of the Labrador coast near Hopedale. On the spiders of the alpine region see J. H. Emerton in *Appalachia*, 13 (1914), 143–159; *id.* in *Canad. Field-Naturalist*, 34 (1920), 108. C. H. Hitchcock (in *Geol. of N. H.* 1, 573–574) attempted to correlate the alpine and subalpine divisions of the flora with those of the insects, but could not attain precise agreement. W. F. Flint (in *Rep. of Forest Comm. of N. H.* (1885), 31) thought the boundaries between the Canadian and Alleghenian zones to be more marked in the case of animals, which can select their abodes, than in the case of plants which must grow, if at all, where their seeds fall.

The explanation here set forth well accounts for the existence of various species of distinctly arctic or subarctic affinities upon

mountain summits isolated and often very remote from one another, and Fernald[1] states that there are at present more than 400 arctic-alpine and high northern species of *Pteridophyta* and *Spermatophyta* known to occur at such isolated alpine or cliff stations south of the St. Lawrence River.

The larger aspect of the same question appears when we seek the wider geographical affinities of our alpine flora. Asa Gray[2] attempted a statistical investigation of this flora as part of a larger study, and drew up a list of species found only in the alpine regions of the White Mountains, the Green Mountains, the Adirondacks, and Ktaadn, in which were included 33 species (all of them, as it happens, found in the White Mountain alpine area). Of these he considered two as peculiar to these regions, two others as North American, and the other 29 as identical with European species. Of twelve subalpine species, *i. e.*, species found both in the alpine area and also outside it (all of them occurring in the White Mountains), he found nine to be European. In a subsequent article[3] he corrected these figures, making 37 alpine species (32 of them European) and 16 subalpine (11 European). That is, of our distinctively alpine species over 86% were to be regarded as European. C. H. Hitchcock,[4] following the work of Dr. Nathan Barrows of Meriden, New Hampshire, seventeen years later and with an estimate based on a list of 54 strictly alpine species, arrived at 79% as the proportion of European species. Since the time of these calculations further light has been cast upon the distribution of our species and various segregations have been proposed for species formerly tentatively and at times hastily considered as identical with Old World types, so that a new calculation seems in place. As essentially alpine species the following may be listed, with an indication of their general distribution (in a few cases these may, even in our latitude, descend to lower levels). The data are taken from the seventh edition of Gray's *Manual*, modified by corrections which I owe to the kindness of Professor Fernald. Hybrids and mere color forms are here omitted, as well as one or two varieties of

[1] In *Rhod.* **9** (1907), 152.

[2] In *Am. Journ. of Arts and Sci.* 2 ser. **22** (1856), 230–231.

[3] In the same journal, **23** (1857), 62–63.

[4] *Geol. of N. H.* **1** (1874), 571.

ambiguous status (in cases where the species to which they belong are also represented in our flora).

Lycopodium annotinum, var. *pungens*	Asia
Selago	Eurasia, southern South America
Agropyron caninum, var. *Hornemanni*	Europe
Agrostis borcalis	Eurasia
Calamagrostis neglecta	Eurasia
Pickeringii	Newfoundland to Minnesota, Nova Scotia, and eastern Massachusetts
Deschampsia atropurpurea	Eurasia
Festuca rubra, var. *prolifera*	Newfoundland to eastern Siberia, south to Maine and New Hampshire
Hierochloë alpina	Europe
Phleum alpinum	Eurasia
Poa glauca	Eurasia
laxa	Eurasia
Trisetum spicatum, var. *pilosiglume*	Labrador to northern New England and Lake Superior
Carex atratiformis	Labrador to Alberta and northern New England
capillaris	Eurasia
capitata	Eurasia; mountains of Mexico and South America
lenticularis, var. *albi-montana*	Mountains of Gaspé Co., Quebec, to New Hampshire
rigida, var. *Bigelovii*	Eurasia
scirpoidea	Eurasia
Scirpus cespitosus, var. *callosus*	Eurasia (*S. cespitosus*, *β. austriacus; cf. Rhod.* **23** (1921), 23–24).
Juncus trifidus	Eurasia
Luzula confusa	Eurasia
spicata	Eurasia
Salix argyrocarpa	Labrador to New Hampshire
herbacea	Eurasia
planifolia	Labrador to northern New England
Uva-ursi	Labrador to northern New England
Betula glandulosa	Asia
var. *sibirica*	Asia
papyrifera, var. *minor*	Greenland and Labrador to northern New England and Saskatchewan
Oxyria digyna	Eurasia
Polygonum viviparum	Eurasia
Paronychia argyrocoma, var. *albi-montana*	Western Maine, New Hampshire, Massachusetts
Arenaria groenlandica	Greenland and Labrador to New England

Silene acaulis, var. *exscapa*	Eurasia
Barbarea orthoceras	Eurasia
Cardamine bellidifolia, var. *laxa*	Greenland
Saxifraga rivularis	Eurasia
Geum Peckii	Endemic in White Mountains
Potentilla monspeliensis, var. *labradorica*	Labrador to New Hampshire
Robbinsiana	Endemic in White Mountains
Rubus Chamaemorus	Eurasia
Sibbaldia procumbens	Eurasia
Spiraea latifolia, var. *septentrionalis*	Newfoundland and Labrador to New Hampshire
Empetrum atropurpureum	Labrador to northern New England
nigrum	Eurasia
Viola palustris	Eurasia
Epilobium lactiflorum	Eurasia
Hornemanni	Eurasia
palustre	Eurasia
var. *labradoricum*	Greenland
Arctostaphylos alpina	Eurasia
Cassiope hypnoides	Eurasia
Ledum groenlandicum	Greenland
Loiseleuria procumbens	Eurasia
Phyllodoce coerulea	Eurasia
Rhododendron lapponicum	Eurasia
Vaccinium pennsylvanicum, var. *angustifolium*	Labrador to New England
uliginosum, var. *alpinum*	Greenland and Labrador to Siberia, south to New England, etc.
Diapensia lapponica	Eurasia
Castilleja pallida, var. *septentrionalis*	Labrador to Alaska, New England, and South Dakota
Euphrasia Oakesii	Labrador to New Hampshire
Williamsii	America (endemic save for a var. in Newfoundland)
Veronica alpina, var. *unalaschcensis*	Eurasia
Houstonia caerulea, var. *Faxonorum*	Endemic in White Mountains
Arnica mollis	Gaspé Co., Quebec, to British Columbia, south to Maine, New Hampshire, etc.
Aster puniceus, var. *oligocephalus*	Labrador to northern New England and Lake Superior
Gnaphalium supinum	Europe
Prenanthes Boottii	Northern New England and northern New York
nana	Labrador to northern New England and northern New York

Solidago Cutleri	Northern New England to northern New York
macrophylla, var. *thyrsoidea*	Labrador to New Hampshire

The total of the species and varieties above listed is 72, of which 35 (or 48%) are also Eurasian (*i. e.*, are circumboreal), 3 more (4%) are also European but not Asiatic, 5 (7%) are also found in Greenland, and 5 (7%) in Asia but not in Europe, while 24 (33%) are, so far as we at present know, confined to North America. In other words, about 52% of our alpine flora is found in Europe and nearly 60% in Europe plus Greenland. Furthermore, of the North American species and varieties 14 (19%) are found from Labrador southward, 2 (3%) from Newfoundland southward, 2 from the Gaspé Peninsula southward, 2 are limited to the mountains of northern New England and New York, and 3 are endemic in the White Mountains. Of these North American species nearly all reach their southern limit (for the eastern part of the country) on or near the mountains of northern New England and New York (*Calamagrostis Pickeringii* having outlying stations in Essex County, Massachusetts, and *Paronychia argyrocoma*, var. *albi-montana* belonging to an essentially southern genus and being almost or quite unique in our alpine flora as an element derived from the south, as noted by M. L. Fernald in *Rhod.* 8 (1906), 102). The generally boreal character of the flora is, then, clear, and the agreement of all these facts with the theory of Forbes, Darwin, Hooker, and others as to the effects of the glacial period upon our mountain flora is obvious. The two Asiatic members of our alpine society may be explained as part of the general circumboreal group; the South American one (*Empetrum atropurpureum*) perhaps, like other species of similar distribution not here concerning us, may be accounted for by such theories of the extension of glacial influence into the southern hemisphere as Darwin sets forth in the twelfth chapter of the *Origin of Species* (1887 ed., 335–342).

History of Botanical Investigations in Coös County

Until the present generation, the history of botanical exploration in Coös County has been almost entirely that of collecting upon the Presidential Range, and the earlier phases of this, from the casual observations of Darby Field in 1642 and the earliest

scientific records made by Rev. Manasseh Cutler and his party in 1784 down to the death of William Oakes in 1848, I have treated at length elsewhere[1] so that the body of information there collected need not be repeated. For convenience, however, there may be here inserted a list of White Mountain collectors and the dates of their visits,[2] which summarizes briefly the general results of the article. The later data in the list (and many of the earlier) are compiled chiefly from herbarium labels, and the list has been brought down to date and enlarged to include other collections in the County, not merely those of the Presidential Range.

1784 M. Cutler
1804 Cutler, W. D. Peck
1816 J. Bigelow, F. Boott, J. W. Boott
1819 G. B. Emerson
1823 B. D. Greene, H. Little
Before 1824 J. Locke
1824 J. Barratt, T. Nuttall (*cf. Rhod.* **20** (1918), 39)
1825 W. Oakes, C. Pickering
1826 Oakes
1827 Oakes, Pickering (*cf. Rhod. l. c.*)
1829 J. W. Boott, J. W. Robbins
1837 E. Tuckerman
1838 Tuckerman
1839 H. D. and J. Thoreau, Tuckerman
1840 T. W. Higginson (?), G. Hunt (collected *Cassiope hypnoides* now in the herbarium of the University of Illinois), Tuckerman
1841 Bigelow, E. W. Southwick
1842 W. Boott, A. Gray, Higginson, Tuckerman
1843 R. C. Alexander, A. W. Chapman, Oakes, Tuckerman
1844 Oakes, Tuckerman
1845 C. Lyell, Oakes, Tuckerman
1846 J. A. Lowell, Oakes, Tuckerman
1847 Lowell, Oakes (?)
1853 W. Boott
1855 W. Boott
1856 G. Engelmann was at Echo Lake, and may have come into the County
1857 W. Boott
1858 J. Blake, D. C. Eaton, E. S. Hoar, T. P. James, H. D. Thoreau, Tuckerman
1859 G. L. Goodale

[1] In *Appalachia*, **14** (1917), 157–178; *cf. Rhod.* **20** (1918), 39.

[2] *Appalachia*, **14**, 177, n. 3. In the original article additional literary evidence for some of these visits will be found, which is not here repeated.

1861 W. Boott, J. W. Dawson
1862 Blake, J. W. Chickering, H. Mann
1863 Mann
1863 or 1864 W. Boott
1864 Chickering
1865 W. Boott, J. Robinson
1866 C. E. Smith, Tuckerman
1867 H. Willey
1868 Goodale (?), Willey
1869 Goodale (?)
1870 Goodale (?)
Before 1871, N. Barrows (*Geol. of N. H.* 1 (1874), 568–569.
1871 W. F. Flint, Goodale (?)
1872 C. E. Faxon, Goodale (?)
1873 W. Boott
1874 W. Boott, Chickering, Miss F. C. Prince, A. P. Garber, T. Morong, J. Robinson
1875 Chickering, E. and C. E. Faxon, L. F. Ward
1876 J. A. Allen, Flint, J. H. Huntington
1877 Chickering, E. and C. E. Faxon, C. G. Pringle, H. A. Young
1878 J. A. Allen, T. D. Allen, E. and C. E. Faxon, F. H. Horsford, Pringle
1879 E. and C. E. Faxon, W. C. Lane, Pringle
1880 J. A. Allen, A. Brown, W. Deane, E. and C. E. Faxon, Pringle, W. P. Rich, Miss E. F. Wiggins, Young
1881 Deane, E. and C. E. Faxon, W. H. Manning
1882 Deane, W. G. Farlow, E. and C. E. Faxon, A. E. Philbrook, Mrs. L. D. Pychowska, Mr. Rudkin, F. L. Scribner
1883 A. P. Briggs, C. F. Batchelder, Miss S. C. Batchelder, Deane, A. Fairbanks, E. and C. E. Faxon, T. O. Fuller, J. J. Greenough, C. H. Hitchcock, Miss S. Minns, Philbrook, Mrs. Pychowska, R. Rounds
1884 A. P. Chadbourne, Deane, Farlow, E. and C. E. Faxon, C. R. Lamb, Manning, Miss Minns
1885 Miss H. L. Brown, Deane, Farlow, E. and C. E. Faxon, Miss Minns
1886 E. and C. E. Faxon, C. H. Hitchcock, Lamb, Philbrook, Miss G. M. Sanger
1887 W. C. Cusick, E. and C. E. Faxon, Greenough, Miss Minns, W. N. Suksdorf
1888 Mrs. E. Bartow, E. and C. E. Faxon, Miss Minns, Philbrook, Mrs. A. T. Slosson
1889 Miss M. Bell, J. R. Churchill, E. and C. E. Faxon
1890 Churchill, E. and C. E. Faxon, G. G. Kennedy, Miss Prince
1891 J. F. Collins, Farlow, E. and C. E. Faxon, C. B. Graves, Kennedy, Philbrook
1892 Miss Prince

1893 O. Bangs, Miss E. W. Cook, Farlow, E. and C. E. Faxon, G. S. Miller, Jr., E. F. Williams
1894 J. W. Blankinship, Miss Cook, Deane, Miss C. M. Endicott, Farlow, E. and C. E. Faxon, Fuller, E. F. Williams
1895 Churchill, Deane, E. and C. E. Faxon, Kennedy, A. S. Pease, H. A. Purdie, F. A. Shute, Mrs. A. F. Stevens, H. H. Taylor, L. M. Watson, E. F. and H. J. Williams
1896 W. Brewster, Deane, E. and C. E. Faxon, E. D. Merrill, Pease, E. F. and H. J. Williams
1897 Deane, E. and C. E. Faxon, Kennedy, Pease, Purdie, C. A. L. Richards, Miss E. Richards, E. F., H. J., and N. Williams
1898 W. W. Eggleston, E. and C. E. Faxon, J. M. Greenman, A. J. Grout, Pease, E. F. Williams
1899 Eggleston, E. and C. E. Faxon, Pease, Mrs. E. H. Terry, E. F. Williams
1900 W. R. Davis, F. Endicott, F. F. Forbes, Fuller, W. S. Hunt, Pease
1901 Miss Cook, Eggleston, Forbes, A. H. Moore, Pease, B. L. Robinson, J. Robinson, H. E. Sargent, E. F. Williams
1902 C. H. Bissell, Deane, Davis, C. E. Faxon, Forbes, A. S. Hitchcock, Moore, Pease, J. Robinson, Mrs. Terry, R. A. Ware, E. F. Williams
1903 Deane, F. G. Floyd, J. W. Harshberger, Moore, Pease, B. L. Robinson, Mrs. Terry, E. F. Williams
1904 Deane, A. Doolittle, Miss E. Evans, E. L. Goldsborough, W. C. Kendall, R. B. Mackintosh, Moore, Mrs. G. F. Moore, Pease
1905 Deane, Purdie
1906 Deane, Moore, Mrs. G. F. Moore, Pease, L. A. Wardwell, E. F. Williams
1907 Deane, Moore, Pease, E. F. Williams
1908 Deane, Mrs. G. N. McMillan, Moore, Pease, Philbrook, G. B. Wellman
1909 Deane, Moore, Pease, H. St. John
1910 V. Bailey, Deane, Miss E. Locke, Mrs. G. N. McMillan, Moore, Pease
1911 Deane, St. John
1912 Miss H. C. Blaney, Mrs. McMillan, Moore, Pease, St. John, Mrs. G. Sheffield
1913 Deane, Moore, Pease, Wellman, S. Wilson
1914 Deane, Forbes, Miss A. P. Lowell, Moore, Pease, S. N. F. Sanford, A. C. Sprague, Miss S. D. Sheppard
1915 Miss L. M. Brown, Deane, Miss N. Dike, Miss C. A. Gauthier, Moore, Pease, Mrs. Sheffield, Miss J. H. D. Stone, Miss A. Wetherbee
1916 Miss A. Block, Miss E. Brackett, Deane, Mrs. E. S. Drown, Miss M. Greenough, Moore, Pease, Miss R. K. Stowell
1917 A. L. Andrews, Miss A. W. Christensen, Deane, Miss E. Dulin, A. W. Evans, M. L. Fernald, Miss Gauthier, A. S. Hitchcock, Miss L. L. Howe, V. D. Lowe, Philbrook, Pease

1918 Deane, Harshberger, W. H. Munter, Pease, D. S. Rushmore, C. Schneider
1919 Deane, Mrs. J. L. Moore, W. H. Munter, Pease
1920 Mrs. A. G. Balch, Deane, Pease, Miss M. S. Tappan
1921 Deane, T. W. Edmondson, Pease
1922 Deane, Mrs. C. H. French, Pease
1923 Deane, Pease, Ware
Without date: J. Carey, A. P. Chute, C. Dewey, C. Hall, S. T. Olney, J. Schrenk, C. J. Sprague

For portraits of Bigelow, Oakes, Tuckerman, F. Boott, Hitchcock, and Huntington see the plates in A. H. Bent's *Bibliography of the White Mountains* (1911); for one of Cutler the *Life, Journals, and Correspondence of Rev. Manasseh Cutler*, 1 (1888); for Pickering the frontispiece of his *Chronological Hist. of Plants* (1879); for Nuttall *Proc. Iowa Acad. of Sci.* 26 (1919), 440; for E. Faxon *Rhod.* 2 (1900), 107; for Pringle *Rhod.* 13 (1911), 225; for Deane *Smithsonian Misc. Collections*, 68, 12 (1917), 37; for C. E. Faxon *Rhod.* 20 (1918), 117; for Kennedy *Rhod.* 21 (1919), 25; and for Farlow *Rhod.* 22 (1920), 1.

Among the landmarks still bearing the names of White Mountain botanists, so active in the early exploration of the Great Range, are Cutler River (named by the Cutler-Belknap party in 1784), Bigelow Lawn, Boott Spur (named for Francis Boott), Oakes Gulf (named by Tuckerman; *cf.* a letter of Oakes to Robbins, dated 6 Aug., 1843, in the possession of Mr. W. Deane); Tuckerman Ravine (so called as early as 1848; perhaps by Oakes (?)), Huntington Ravine (so named about 1870–1871 for what had previously been known as the 'Grand Gulf'—to be carefully distinguished from the 'Great Gulf'). Names now obsolete are Boott Gulf (used by Oakes in writing to Robbins, 23 July, 1846, for what is now Tuckerman Ravine), Robbins Springs (Oakes to Robbins, 6 Aug., 1843, perhaps of the springs in the Alpine Garden), and Robbins Plain (Oakes to Robbins, 13 July, 1844; possibly of the Alpine Garden), also Tuckerman Peak (on the Great Range) and Tuckerman Brook, according to Dr. F. Tuckerman, who has discovered these names on labels of some of Professor E. Tuckerman's lichens at Cambridge. Outside our area lie Tuckerman (also called Arethusa) Falls, Thoreau Falls, Mt. Hitchcock, Hitchcock Flume, and Mt. Huntington; *cf.* F. H. Burt in *Appalachia*, 13 (1915), 359–390.

The collectors here noted have, as already stated, been chiefly

associated with the Presidential Range, which has naturally been very often examined, but in the less frequented parts of which work yet remains to be done. In addition it should be remarked that the immediately adjacent valleys (Crawford's, Randolph, and Pinkham Notch) have received a good deal of attention, and that the towns of Whitefield (in 1894–1897) and Shelburne (1880–1885, 1902 to date) have been very intensively explored for many years by Mr. Walter Deane. Outside these areas at the time when this work was begun collecting had been merely sporadic.

Plan of this Work.

In 1906 the author, in collaboration with Mr. A. H. Moore, undertook a more exhaustive study than had yet been made of the distribution of plants in Coös County. Mr. Moore of late years has been prevented by other interests from active participation in the work, and he is, accordingly, not to be held responsible for its final form. It was at the outset determined to make the resulting book rest upon well-documented materials, and accordingly the Gray Herbarium, the herbaria of the New England Botanical Club, of the Boston Society of Natural History, of the South Natick Historical, Natural History, and Library Society (containing collections of Dr. J. W. Robbins), and of Messrs. Walter Deane and E. F. Williams were carefully inspected, and the National Herbarium in Washington, that of the New York Botanical Garden, and various private herbaria were studied in selected portions, to discover specimens of plants collected within Coös County. Very considerable care was used in verifying the correctness of identifications, and not a few errors of determination were thus corrected. Full data (name of the plant, collector, place, date, and name of the herbarium containing the specimen) were entered in card-catalogue form, and from this catalogue a check-list was made for ready consultation in the field.

The summer of 1907 saw the beginning of an attempt to explore more fully the parts of the County as yet botanically little known, the first trip being to the northern end of the State. In each succeeding summer (except 1911) this work has been continued, and some few collections, at least, have been made from each of the 43 townships and grants which the County contains. In this way our knowledge of distribution has been much extended, and

in addition more intensive work has been done in some localities, so that at present the floras of Randolph and Shelburne are represented by actual specimens of all plants known to grow in them (in the latter township by the active assistance of Mr. Deane). The plants thus collected by the author and Mr. Moore were deposited in their respective herbaria, of which the former collection was transferred in 1912 to the Herbarium of the New England Botanical Club (in Cambridge, Massachusetts), in which all subsequent Coös County collections by A. S. Pease have been placed. The herbarium of Mr. Moore is still retained by him in Cambridge. All records, then, based on these specimens in public or private herbaria should be capable of verification and revision.

It gradually appeared, however, that additional observations not supported by actual specimens might yet materially assist our knowledge of the distribution of certain species, particularly of those which, on account of their very commonness or their intractability in pressing, are too often neglected by collectors, and there have, accordingly, been added in the catalogue a considerable number of such records, carefully differentiated from those records resting upon specimens by means of enclosing within a parenthesis the name of the township in which a species has been observed but not collected. It is to be understood that such records are not mere random impressions but data noted immediately after observation when the memory of them was distinct, and that this method has not been employed for species which, within our limits, appear difficult to distinguish or critical in character. Segregations hereafter made will naturally destroy the value of some of these records, yet for the sake of giving greater completeness to the present state of our knowledge of distribution it has seemed of value to include them, marking them so clearly that anyone who does not wish to use them will be in no way misled by their presence.

A further type of aid is to be found in catalogues published by other botanists in the past. The difficulties in the use of such sources, however, are greater than would at first appear. Many such lists are of a very fragmentary, a careless, or an inaccurate character, sometimes containing determinations which are certainly incorrect, and almost all of them, following the easygoing

habit of the earlier collectors, making no very precise citations of localities, the term 'White Mountains,' or 'alpine regions' covering spots as diverse and distant as King Ravine and Mt. Crawford. Thus Oakes commonly labelled his specimens 'in alpinis montium Alborum,' etc., though in a letter of 28 July, 1841, to Dr. Robbins (perhaps in answer to a criticism) he says: "Of the W. M^{tn} localities I can speak pretty distinctly but not so much so as I could wish. I mean in future to be careful as to this point." Local floras of parts of the County outside the Presidential Range are almost negligible. Great caution has been employed in admitting into the present list any species unsupported by other than printed testimony, and I have not felt it necessary to cite such evidence when the herbarium material was so abundant as to make it superfluous.

Bibliography of Catalogues, Articles, etc., dealing with the Flora of Coös County.

Many botanical writers, from Cutler to the present time, have mentioned a few of the striking plants of the alpine region, without giving any formal lists, and many general botanical works and manuals of a larger scope, from the time of F. T. Pursh[1] to the latest manuals, incidentally mention such plants, but of more definite lists or catalogues the following are the most significant.

J. Bigelow in *N. E. Journ. of Med. and Surg.* **5** (1816), 332–337. 44 species are listed as growing above the tree-line. This catalogue was copied by

C. S. Rafinesque-Schmaltz in *Am. Monthly Mag.* **1** (1817), 440–441: *Florula of the White Mountains of New Hampshire.*

J. Barratt in *The Classic or College Monthly*, **2** (1842), 182–185, who lists 21 species collected in 1841 by his pupil, E. W. Southwick.

[W. Oakes was in 1842 asked to prepare a catalogue of alpine plants for the *Final Report of the Geol. Surv. of the State of N. H.*, and collected much material for that purpose, but never published.]

W. S. Clark and E. Tuckerman in J. H. Spaulding's *Historical Relics of the White Mountains*, 3 ed. (1855), 94–97 (later editions have differing pagination), listing 61 alpine species and 33 lowland plants occurring in the alpine region.

A. Gray in *Am. Journ. of Sci. and Arts*, 2 ser. **22** (1856), 230–231, names 33 species of alpine plants from the White Mountains, Adirondacks, Green Mountains, and Ktaadn (not distinguished, but all occurring in the White Moun-

[1] *Flora Americae Septentrionalis*, 2 ed. **1** (1816). The plants which he refers to the White Mountains I have cited in *Appalachia*, **14** (1917), 160, n. 4.

tains) and 12 subalpine species, and in vol. 23 (1857), 62–63, he corrects his figures to 37 and 16 respectively.

J. W. Dawson in *Canad. Naturalist and Geologist*, 7 (1862), 81–102: *Notes on the flora of the White Mountains.* On pp. 86–87 he notes the plants of Tuckerman Ravine and of the alpine barrens; *cf.* pp. 98 ff.

W. F. Flint in the *Geol. of N. H.* 1 (1874), 395–413, gives a catalogue of the plants of the State, those ascending to the alpine or subalpine region being marked M (of these there are 58), and those limited to that area marked *M* (49 species).

N. Barrows furnished data used by C. H. Hitchcock in the same work (1, 568–574), with a list of 58 Canadian species ascending to the alpine and subalpine region and 54 limited to that area.

J. W. Chickering in *Field and Forest*, 2 (1876), 98–99, has a *Catalogue of the alpine and sub-alpine flora of the White Mountains of New Hampshire*, listing 71 species.

J. H. Huntington in *Appalachia*, 1 (1877), 100–106, with various other information, has lists of the plants in bloom on four different dates during the summer—a total of 67 species of alpine and subalpine plants.

[B. P. Mann in *Appalachia*, 1 (1877), 185–186, reported a plan for the systematic observation of White Mountain plants by means of a check-list.]

G. S. Miller, Jr., in *Proc. Boston Soc. Nat. Hist.* 26 (1895), 177 ff., in an article on the small mammals in the New Hampshire mountains, gives (pp. 178–179) a list of plants found by him and O. Bangs in 1893 on Mt. Washington at an elevation of over 5000 feet, containing 81 species and varieties. The determinations were assisted by E. Faxon.

'FEHD' (=T. O. Fuller, F. Endicott, W. S. Hunt, and W. R. Davis) in *Among the Clouds*, 24 (1900) in the issues of July 20, 21, 23, 25, 26, 27, and 28: *Mountain flora.* A list of 105 species found in the alpine and subalpine regions by members of the Appalachian Mountain Club during their field meeting on Mt. Washington.

'FEHD' in *Among the Clouds*, 31 (1907), issues of July 17–20, 23–27, 29–31, Aug. 1–3, 5–10, and 12–13: *The flowers of Mt. Washington.* A revision of the previous list, with the addition of 10 species.

Mrs. A. D. Wilde, *Plants of Mt. Washington, N. H. A list of most of the plants to be found in the alpine and sub-alpine regions of Mt. Washington and the Great Range.* Intended for members of the Appalachian Mountain Club at their field meeting on Mt. Washington in 1920. It is a pamphlet based on the 'FEHD' list, and contains 125 species. It was also reprinted (with the omission of *Paronychia*) in *Appalachia*, 15 (1921), 211–214, under the same title.

In addition to these definite catalogues many articles have appeared on individual species of White Mountain plants, or on selected topics concerning the flora of the mountains or other parts of Coös County. These have been examined to secure data for species occurring in the County, and various localities cited in them have been verified by the inspection of specimens or the rediscovery of old stations. Naturally such verification has not usually been attempted in the case of species of general distribution, for it would oftener be

easier to find five new localities than to rediscover one old one, and accordingly, for species otherwise well represented, such references have usually been disregarded. For rare species, however, particularly those not otherwise known in our area, much greater pains have been taken, and some important stations recovered. A few, such as that of the ferns which once graced the cliffs about Berlin Falls, have apparently been destroyed.

The following list, though not to be considered as exhaustive, contains the more important of these articles and discussions (many additional titles might be cited which are concerned primarily with the cryptogamous flora). In it new species or varieties of which the type station lies in Coös County are designated with an asterisk. Some additional titles of a more general character may be gleaned from A. H. Bent's *Bibliography of the White Mountains* (1911) and Miss H. E. Stockbridge's *Bibliography of the southern Appalachian and White Mountain regions* (1911).

J. Josselyn, *New England's rarities discovered* (1672; later edition by E. Tuckerman in 1860); *cf. Appalachia*, 14 (1917), 158.

Life, journals, and correspondence of Rev. Manasseh Cutler, LL.D. 1 (1888), 96–110, containing an account of the visit of Cutler, Belknap, and others to Mt. Washington in 1784 (*cf. Appalachia*, 14, 158–159), and (pp. 110–113) a description of a trip made by Cutler, N. Bowditch, and Professor W. D. Peck in 1804. For the former trip *cf.* also J. Belknap, *Journal of a tour to the White Mountains in July, 1784* (printed from the MS. by Charles Deane in 1876); also J. Belknap in *Trans. Am. Philos. Soc.* 2 (1786), 42–49: *Description of the White Mountains in New Hampshire* (pp. 45–46) tells a little of the flora, but in a very general way. Belknap's *Hist. of New Hampshire*, 3 (1792), 96–127, in the chapter on *Forest-trees and other vegetable productions*, has nothing specifically important for Coös County.

B. S. Barton in *Philadelphia Med. and Phys. Journ.* 1 (1804), 164–165, describes the ascent of Cutler and Peck, with further notes on the same in vol. 2, 1st suppl. (1806), 57–58; *cf. Appalachia*, 14, 159–162.

F. T. Pursh, *Flora Americae Septentrionalis* (1814), tells in his introduction of inspecting Professor Peck's collection of White Mountain plants, and in his second edition (1816) he cites over a dozen species from our area; *cf. Appalachia*, 14, 159–161.

T. Nuttall, *Genera of North American plants*, 1 (1818), has several references (*e. g.*, pp. 106, 123, 135, 309) to plants of the White Mountains.

J. Bigelow, *Florula Bostoniensis*, 2 ed. (1824), includes 42 White Mountain species, and in the 3d edition (1840), 48 species.

C. Dewey in *Am. Journ. Sci.* 10 (1826), 42. A note on '*Carex limosa*' found on Mt. Washington by Barratt. In 10, 272, he publishes **Carex Washingtoniana* from Mt. Washington.

C. Dewey in *Am. Journ. Sci.* 39 (1840), 50–53, discusses various White Mountain *Carices*.

W. Oakes in *Hovey's Mag. of Hort.* 7 (1841), 178–185: *Notices of some rare plants of New England with descriptions of some new species.* Includes **Eleocharis Robbinsii* (178–179), **Potamogeton Robbinsii* (180), **Galium Littellii* (179), **Viburnum Oxycoccus*, var. *eradiatum* (183), **Salix fusca* (184).

E. Tuckerman in *Am. Journ. Sci.* 45 (1843), 27–49: *Observations on some interesting plants of New England*, including descriptions of **Campanula rotundifolia*, var. *alpina* (27), **Betula Littelliana* (30), **B. papyracea*, var. *minor* (31), **Salix Cutleri* (36), **Carex rigida*, var. *Bigelovii* (41), **Agrostis Pickeringii* and its var. *rupicola* (42), **Agrostis concinna* (42), **A. laxiflora*, var. *montana* (43), **A. altissima*, var. *laxa* (44)—these last two varieties in Crawford Notch, and hence perhaps outside our limits—,**Lycopodium annotinum*, var. *montanum* (46).

E. Tuckerman in *Hovey's Mag. of Hort.* 9 (1843), 142–145: *Descriptions of several new plants of New England* redescribes *Salix Cutleri* (142), *Agrostis Pickeringii* (143), and *A. concinna* (143); also he publishes **Agrostis Torreyi* and **A. Novae-Angliae* (synonyms of his just-published *A. laxiflora*, var. *montana* and *A. altissima*, var. *laxa*, respectively).

W. Oakes in *Hovey's Mag. of Hort.* 13 (1847), 171–174, is chiefly concerned with mosses and hepatics of the White Mountains.

W. Oakes in *Hovey's Mag. of Hort.* 13 (1847), 217–218: *Notice of some of the plants of New England.* This describes the first collections of a number of mountain plants, including *Paronychia argyrocoma* [, var. *albimontana*].

E. Tuckerman in *Am. Journ. Sci.* 56 (1848), 224–232: *Observations on New England plants, with characters of several new species.* On p. 224 he discusses two varieties (not new) of *Epilobium alpinum* from the White Mountains.

Sir C. Lyell, *Second visit to the United States of North America*, 1 (1849), especially pp. 58–84, with an account of his ascent of Mt. Washington, in company with Oakes, and a description of the chief characteristics of the flora.

A. Gray in *Am. Journ. Sci.* 57 (1849), 138–142, gives an obituary of W. Oakes, with some remarks on his collections.

E. Tuckerman in Rev. T. S. King's *White Hills* (1860), 230–241 (reprinted in later editions). A popular list, of the more striking species only, cited by their English names. Of greater value to the botanist is Tuckerman's account in the same work (34–36) of the history of the exploration of the White Mountains, with much material on the early botanists (*cf. Geol. of N. H.* 1 (1874), 61 ff.; J. H. Huntington in *Appalachia*, 1 (1877), 100 ff.).

J. W. Dawson, *Alpine and arctic plants* (1862).

W. G. Nowell in *Appalachia*, 1 (1877), 128, discusses the upper and lower limits of certain plants of the Great Range.

G. C. Mann in *Appalachia*, 1 (1877), 201, is described as reporting upon botanical excursions upon the same range.

W. F. Flint in the eighth *Annual Rep. of the Board of Agr. of N. H.* (1879), 281–307: *New Hampshire grasses.* This article has much on the economic importance of the different grasses, of which about a dozen are especially noted as found in the alpine region.

Granite Monthly, 2 (1878), 76–78, on the forest vegetation in New Hampshire.

Mrs. L. D. and Miss Pychowska in *Appalachia*, 2 (1880), 125, describe the naming of Gentian Pond in Shelburne for *Gentiana linearis*.

Mrs. L. D. Pychowska in *Appalachia*, 3 (1883), 168–169: *Botanical notes made in the summer of 1882 at Randolph, N. H.* This article is especially concerned with the flora of the Ice Gulch in Randolph and the dates of flowering

there (*cf.* pp. 221–222). On p. 220 of the same volume she notes certain plants found at the outlet of the Pond of Safety in Randolph.

W. G. Farlow in *Appalachia*, 3 (1883), 232–251: *Notes on the cryptogamic flora of the White Mountains.* A number of phanerogamic species of the Presidential Range and of Shelburne are mentioned, and some ferns of the Alpine Cascade at Gorham.

Mrs. L. D. Pychowska in *Appalachia*, 3 (1883), 254–255: *Botanical notes made in the summer of 1883 at Randolph, N. H.*

W. F. Flint in *Rep. of the Forestry Comm. of N. H.* (1885), 30–73, in an account of *The trees and shrubs comprising the New Hampshire forests*, gives (69–71) tables, for the State, of Alleghenian species, Canadian species, and species common to both zones. This report was reprinted, with additions, in the 19th *Rep. of the Trustees of the N. H. College of Agr. and Mech. Arts* (1890), 60–99, and, separately, with an introductory note by H. G. Jesup, at Manchester (1891). The original report is signed by a committee, but seems to be largely the work of Flint. Some of the statements affecting the trees of our area are repeated from this work by L. L. Dame and H. Brooks in their *Handbook of the trees of New England* (1901).

A. Gray in *Proc. Am. Acad.* 21 (1886), 529–547, wrote an obituary notice of E. Tuckerman, mentioning his work in the White Mountains.

G. Allen in *Pop. Sci. Monthly*, 30 (1887), 590–600: *A Mount Washington sandwort.*

G. Allen in *Pop. Sci. Monthly*, 32 (1888), 189–199: *American cinquefoils.* These two popular articles contain many inaccuracies.

M. M. Pychowska in *Appalachia*, 5 (1888), 184–194: *Two in the alpine pastures.* Popular sketch of the region above tree-line.

M. S. Bebb in *Bull. Torr. Bot. Club*, 15 (1888), 121–128 (on *Salix pyrifolia*); 16 (1889), 39–42 (*Salix planifolia*); 211–215 (*Salix argyrocarpa* and *S. Uva-ursi*); 17 (1890), 149–151 (*Salix argyrocarpa* × *planifolia* and *S. herbacea*), with the general title: *White Mountain willows.*

W. F. Ganong in F. N. Kneeland's *White Mountain Glimpses*, (1896), 44–50: *The vegetation of the White Mountains.* Condensed from E. Tuckerman's account in T. S. King's *White Hills.*

A. J. Grout in *Plant World*, 2 (1899), 116–118: *A botanist's day on Mt. Washington.* A popular account of an ascent through Tuckerman Ravine, listing a few species observed, including some mosses.

G. H. Tilton in the *History of Lancaster, N. H.* (1899), 283–288, gives a brief and popular sketch of *The trees and shrubs of Lancaster.*

G. G. Kennedy in *Rhodora*, 2 (1900), 107–111, writes an obituary of Edwin Faxon.

E. F. Williams in *Rhod.* 3 (1901), 160–165, compares the floras of Mts. Washington and Ktaadn.

B. L. Robinson in *Rhod.* 3 (1901), 272–273, publishes **Euphrasia Williamsii.*

W. Deane in *Plant World*, 4 (1901), 188–191: *The Knubble—Advice to beginners in botany.* Contains mention of certain species found near Philbrook Farm, Shelburne.

G. M. Allen in *Proc. Manchester Inst. Arts and Sci.* 4 (1902); *A list of the birds of New Hampshire.* On pp. 38–53 there is a discussion of life zones, with some references to plants, especially in the alpine region and in Carter Notch.

W. W. Eggleston in *Rhod.* 4 (1902), 97–98, describes the finding of *Comandra livida* and *Lycopodium sitchense* (*L. sabinaefolium*, var. *sitchense*) on the Presidential Range.

W. Deane in *Rhod.* 4 (1902), 243–244, on *Cephalanthus occidentalis* at Shelburne; *cf. id.* in *Rhod.* 10 (1908), 203–204.

J. W. Harshberger in *Among the Clouds*, 27 (1903), issue of July 18: *Our mountain flora;* issue of July 23: *The Great Gulf.*

A. K. Chittenden in *Biennial Rep. of N. H. Forestry Comm.* for 1903–1904 (1904): *Forest conditions in northern New Hampshire;* pp. iii+131. Pp. 64–77 deal with the *Trees of northern New Hampshire,* and 129–131 contain a list of trees and shrubs. This report was considerably condensed and republished, under the same title, as Bull. 55 of the U. S. Bur. of Forestry (1905); pp. 100. Pp. 52–61 discuss the *Trees of northern New Hampshire,* and 99–100 have the list of trees and shrubs.—In the present work reference is frequently made to Chittenden's work, and unless otherwise specified the second of these two versions is to be understood. The former, however, is the richer in illustrations of forest conditions in our region.

M. L. Fernald in *Rhod.* 8 (1906), 101–104, describes *Paronychia argyrocoma,* *var. *albimontana.*

M. L. Fernald in *Rhod.* 8 (1906), 227–228: *An alpine variety of Solidago macrophylla* (new comb.: var. *thyrsoidea* (E. Meyer) Fern.).

M. L. Fernald in *Rhod.* 9 (1907), 23–25: *The alpine Rhinanthus of Quebec and New Hampshire.*

M. L. Fernald in *Rhod.* 9 (1907), 149–193, discusses the soil preferences of alpine plants, with constant reference to the White Mountain flora.

A. S. Pease and A. H. Moore in *Rhod.* 9 (1907), 209–210: *An alpine variety of Houstonia caerulea* (description of *var. *Faxonorum*).

M. L. Fernald in *Rhod.* 10 (1908), 87–88, publishes *Solidago Cutleri,* named for Manasseh Cutler. There seems to be no definite citation of a type specimen, and since the first localities cited are in Maine the species can hardly be said to be actually described from within our limits.

W. Deane in *Rhod.* 11 (1909), 21–22: *Notes from Shelburne, New Hampshire* (records of half a dozen species).

A. S. Pease in *Rhod.* 11 (1909), 30: *Certain railroad weeds of northern New Hampshire* (eight species noted).

A. S. Pease in *Rhod.* 11 (1909), 31: *A Juncus new to New England* (*J. trifidus,* var. *monanthos* at Dixville Notch).

A. S. Pease in *Rhod.* 11 (1909), 64: *Cryptogramma Stelleri in New Hampshire* (Colebrook).

A. H. Moore in *Rhod.* 11 (1909), 141–147: *Status of Epilobium alpinum and Epilobium Hornemanni* (but with this treatment *cf.* M. L. Fernald in *Rhod.* 20 (1918), 36–38).

D. P. Penhallow in *Rhod.* 11 (1909), 173–177, gives a description of Wheeler Bog in Shelburne, and some members of its flora.

M. L. Fernald in *Rhod.* 11 (1909), 184–185: *The status of Arenaria stricta in New Hampshire* (showing that W. H. Manning's specimen from 'Mt. Washington' was confused in labelling, the specimen really coming from Glens Falls, New York).

M. L. Fernald and C. H. Bissell in *Rhod.* 12 (1910), 50–55, discuss *Lycopodium clavatum* and its varieties *megastachyon* and *monostachyon*.

W. Deane in *Rhod.* 12 (1910), 57–61: *Euphorbia Cyparissias in fruit* (at Shelburne; *cf. id.* in *Rhod.* 14 (1912), 193).

W. Deane in *Rhod.* 12 (1910), 165–166, on a teratological *Trillium erectum* from The Glen.

M. L. Fernald in *Rhod.* 13 (1911), 27, reports the collection of *Anaphalis margaritacea*, var. *occidentalis* in the White Mountains.

A. S. Pease in *Rhod.* 13 (1911), 103: *Helianthus subrhomboideus* in New Hampshire (Berlin and Gorham).

E. Brainerd in *Rhod.* 13 (1911), 225–232, writes an obituary notice of C. G. Pringle.

W. Deane in *Rhod.* 14 (1912), 92–94: *Festuca ovina L., var. duriuscula (L.) Koch in Shelburne, New Hampshire.*

A. S. Pease in *Rhod.* 16 (1914), 194–195: *A form of Potentilla tridentata* (with description of *f. *hirsutifolia* from Milan).

A. S. Pease in *Rhod.* 17 (1915), 72: *A northern Solidago in the White Mountains* (*S. rugosa*, var. *villosa*).

A. H. Moore in *New England Magazine*, 50 (1914), 462–470: *White Mountain wild flowers.* A popular sketch.

A. S. Pease in *Rhod.* 17 (1915), 232–233: *Arenaria stricta in the White Mountains* (Hart Ledge).

A. S. Pease in *Rhod.* 19 (1917), 88–90: *Is Aster tardiflorus a hybrid?*

A. S. Pease in *Rhod.* 19 (1917), 111–112: *Taraxacum ceratophorum in New England* (King Ravine, Mt. Adams).

C. A. Weatherby in *Rhod.* 19 (1917), 116, publishes *Impatiens biflora*, *f. *Peasei* A. H. Moore (the type being from Whitefield); *cf. id.* in *Rhod.* 21 (1919), 98–99.

A. S. Pease in *Appalachia*, 14 (1917), 157–178: *Notes on the botanical exploration of the White Mountains.*

M. L. Fernald in *Rhod.* 19 (1917), 221–223: *A new alpine willow from the White Mountains* (**Salix Peasei* Fern., from King Ravine, Mt. Adams).

M. L. Fernald in *Rhod.* 19 (1917), 254–255: *The boreal and subalpine variety of Spiraea latifolia.*

A. S. Hitchcock in *Smithsonian Miscell. Collections*, 68, 12 (1917), 29–40: *Grasses of the Adirondack and White Mountains.* Contains three views at Shelburne.

A. S. Pease in *Rhod.* 20 (1918), 39: *Nuttall and Pickering in the White Mountains* (on the dates of their visits).

C. S. Sargent in *Rhod.* 20 (1918), 117–122, writes an obituary of C. E. Faxon.

W. Deane in *Rhod.* 21 (1919), 38, notes the occurrence of *Amsinckia barbata* at Shelburne.

J. W. Harshberger in *Geogr. Rev.* 7 (1919), 233–255: *Alpine fell-fields of eastern North America.*

L. W. Riddle in *Rhod.* 22 (1920), 1–8, writes an obituary notice of W. G. Farlow.

E. T. Wherry in *Rhod.* 22 (1920), 37–39, describes the soil conditions in the White Mountains and the relations of the flora to them.

A. H. Bent in *Bull. Geogr. Soc. Philadelphia,* 18 (1920), 56–61: *Trees and flowers of the White Mountains.* Popular sketch.

W. W. Ashe in *Journ. Elisha Mitchell Sci. Soc.* 37 (1922), 183–198: *Forest types of the Appalachian and White Mountains.* This article has comparatively little on the White Mountains, which, according to p. 183, n., are to be discussed in a subsequent paper.

Species Exclusae.

After sifting the evidence from all the sources above enumerated there yet remain certain species whose presence in the County is improbable or dubious, and which are accordingly here listed as *species exclusae.* It should be understood that the reasons for exclusion are by no means all of uniform weight, and the experience of other such lists leads to the expectation that some of these names will later be reinstated. Names rejected simply from the adoption of some synonym (*e. g., Salix candida,* which the older lists report from the Connecticut and Androscoggin valleys, is unquestionably *S. pellita*) or names rejected as the result of segregations subsequent to the time of their use, in cases where the plants originally meant by those who used the names are still present in our catalogue, are, for the most part, omitted from this list, which would otherwise be burdened with a list of synonyms that would obscure its real purpose. In the list the synonymy has been made to conform with that employed in the catalogue.

Woodsia alpina (Bolton) S. F. Gray. Reported by W. G. Farlow (in *Appalachia,* 3 (1883), 251) from the Alpine Cascade in Gorham. *W. glabella* occurs at this station, and in the absence of definite specimens of *W. alpina* it appears safer to consider the citation as due to confusion.

Equisetum variegatum Schleich. W. G. Farlow (in *Appalachia,* 3 (1883), 247) tells of finding this at Shelburne, but subsequent intensive collecting there has not disclosed it, and no specimen appears to be extant.

Selaginella selaginoides (L.) Link. Cited by Pursh (*Flor. Am. Sept.* 2 ed. 1 (1816), 654) from New Hampshire (White Mountains?) and repeated in later works (*e. g.,* W. F. Flint in *Geol. of N. H.* 1 (1874), 413; Gray's *Manual,* 7 ed. (1908), 57). No specimens are at hand, and the report is not certainly from our area. As early as 1843 Oakes, in a letter to Robbins, declares that Pursh's

species (*i. e.*, those entirely depending upon his records) "do not deserve the least credit" (*cf. Appalachia*, 14 (1917), 160).

Abies Fraseri (Pursh) Poir. W. F. Flint (in *Rep. of Forest Comm. of N. H.* (1885), 66) says it "is rarely found in the sub-alpine region of the White Mountains." A not infrequent misunderstanding among the older botanists, probably of *A. balsamea* (L.) Mill., var. *phanerolepis* Fern. (*cf. Rhod.* 11 (1909), 203).

Panicum Ashei Pearson (*P. umbrosum* Le Conte) is reported from Whitefield, in dry sand by a railroad, by Dr. H. St. John (1912), but the specimen has not been seen by the writer and is so far out of range as to merit further study before inclusion in the accepted list.

Zizania aquatica L. Reported by W. F. Flint (in *Geol. of N. H.* 1 (1874), 410) from the Androscoggin River (in New Hampshire). In the 8th *Ann. Rep. N. H. Board of Agr.* (1879), 283, he states more definitely that it was seen along the Androscoggin River near the outlet of Lake Umbagog. The report may be correct, but pending confirmation I have hesitated to include this species among those of the accepted list.

[*Eleocharis Robbinsii* Oakes. This, with *Potamogeton Robbinsii*, was published by Oakes in *Hovey's Mag. of Hort.* 7 (1841), 178–180, and the type station for both was located at Cherry Pond in Jefferson, where they were collected by Dr. J. W. Robbins in 1829. Much search has thus far failed to recover the type specimens, nor have other specimens of these species, so far as I am aware, been collected at this station (which seems admirably suited for both), though it has been frequently visited. The *Potamogeton* has, however, been found elsewhere in the County, and in the feeling that this station for both species is authentic I have admitted the *Eleocharis* (not elsewhere known in the County) into the accepted list.]

Hypoxis hirsuta (L.) Cov. A specimen of this in the herbarium of the Boston Society of Natural History, labelled as collected at Crawford's by Miss S. Minns (no date) has probably suffered some confusion in regard to locality.

Arethusa bulbosa L. The specimen in the herbarium of W. Deane collected by H. Mann in the 'White Mountains' in 1862 is not certainly from our area, though the plant might well be found in it.

Epipactis decipiens (Hook.) Ames. The specimens which for some time passed as this species (Crawford's, Miss S. Minns, 1887) are really of *E. tesselata*.

Betula nigra L., of which there exists a specimen collected by J. W. Chickering in 1862 and purporting to come from rocky summits of the White Mountains, is not to be expected in our limits.

Betula pumila L. Reported by W. F. Flint (*Rep. of Forest Comm. of N. H.* (1885), 60) 'in the White Mountain region.' If alpine, probably a confusion with some form of *B. glandulosa*. In lowland bogs, where it might possibly be expected, it has not yet appeared.

Alchemilla alpina L. Probably based upon a misunderstanding by Pursh (*Flor. Am. Sept.* 2 ed. 1 (1816), 112; *cf.* T. Nuttall, *Genera of N. Am. Plants*, 1 (1818), 106). E. Tuckerman (in *Am. Journ. Sci.* 45 (1843), 28) thinks it may have been *Potentilla tridentata*, but that species seems to have been well recognized at an early date. Against the occurrence of the plant in our area see

further M. L. Fernald and K. M. Wiegand in *Rhod.* 14 (1912), 229–230; also the note on *Selaginella selaginoides* above.

Dryas integrifolia Vahl. F. T. Pursh (*Flor. Am. Sept.* 2 ed. 1 (1816), 350) cites *Dryas tenella* Pursh from the White Mountains on the authority of Professor W. D. Peck (*cf.* T. Nuttall, *Genera of N. Am. Plants*, 1 (1818), 309, who calls it *D. integrifolia*), and J. Bigelow (*Florula Boston.* 3 ed. (1840), 219) states that he has seen a specimen of *Dryas integrifolia* from the White Mountains, but has not found it there himself. For the probable explanation of the confusion see M. L. Fernald in *Rhod.* 5 (1903), 281–283.

Geum triflorum Pursh. In the White Mountains, according to Hooker, *Bot. Mag.* 4 (1828), pl. 2858. Perhaps a confusion with *G. Peckii* Pursh.

Viola blanda Willd. Specimens collected in Shelburne in 1919 by Mr. W. Deane show some likeness to this species, but more probably belong under *V. incognita*.

Epilobium anagallidifolium Lam. Haussknecht's records for the White Mountains have not yet been confirmed by the appearance of the plant there; *cf.* Gray's *Manual*, 7 ed. (1908), 597.

Lyonia ligustrina (L.) DC. Incidentally reported from Shelburne by Professor W. G. Farlow (in *Appalachia*, 3 (1883), 242). The species is found in Maine, not far distant, but Coös County specimens I have not yet seen.

Pyxidanthera barbulata Michx. Reported by Pursh (*Flor. Am. Sept.* 2 ed. 1 (1816), 147) from the White Mountains (under the name of *Diapensia cuneifolia* Pursh) on the authority of Professor W. D. Peck. Possibly a confusion with *D. lapponica* L. (which he also knew, however, under the title of *D. obtusifolia*).

Lomatogonium rotatum (L.) Fries (*cf. Rhod.* 21 (1919), 194). Pursh (*op. cit.* 1, 101) cites this from the White Mountains, as *Swertia pusilla*. Nuttall (*op. cit.* 1, 102) gives the species but assigns no station for it, and Bigelow (*Florula Boston.* 3 ed. (1840), 62) cites it from the White Mountains on the authority of Pursh. Tuckerman (in *Am. Journ. Sci.* 45 (1843), 27) conjectured that Pursh might have mistaken for it an alpine form of *Campanula rotundifolia*, and little doubt is now felt that Pursh's report is erroneous; *cf.* Gray's *Manual*, 7 ed. (1908), 659; Fernald in *Rhod.* 21 (1919), 195, n., who thinks the plant probably does not occur southwest of the Lower St. Lawrence.

Teucrium occidentale Gray, var. *boreale* (Bicknell) Fern. Gray's *Manual*, 7 ed. 693, cites this variety from 'n. N. H.', which might naturally imply Coös County. I have not been able, however, to find any specimens from farther north in the State than Walpole.

Petasites frigidus Fries. Another species assigned by Pursh (*op. cit.* 1, 531) to the White Mountains (under the name of *Tussilago frigida* L.), but without other support it cannot be deemed worthy of credence.

Statistical Summary.

In the following tables are presented certain numerical facts in regard to the species, varieties, and forms constituting the County flora. For purposes of computation hybrids are counted as varieties, and varieties of species whose typical variety is not found in our area are listed as species. The numerical rank of those families which are represented by 25 or more species, varieties, and forms follows:

Compositae	161	Orchidaceae	32
Cyperaceae	144	Polygonaceae	31
Gramineae	119	Scrophulariaceae	29
Rosaceae	92	Caryophyllaceae	28
Ericaceae	41	Labiatae	28
Cruciferae	35	Salicaceae	26
Polypodiaceae	32	Leguminosae	25

Families with a total representation of three or more species, varieties, or forms in which the introduced members outnumber the native are:

	Native	Introduced
Polygonaceae	15	16
Chenopodiaceae	2	10
Amaranthaceae	0	3
Caryophyllaceae	8	20
Papaveraceae	1	3
Cruciferae	9	26
Leguminosae	4	21
Boraginaceae	2	6
Plantaginaceae	1	5

Families with a total representation of ten or more species, varieties, or forms in which all the members are native are:

Polypodiaceae	32	Najadaceae	17
Ophioglossaceae	10	Juncaceae	23
Equisetaceae	11	Orchidaceae	32
Lycopodiaceae	15	Betulaceae	13

It will be at once observed that these are either crypotogamic families or families low in the phanerogamic scale, and, with the exception of the last-named, possess little economic importance which might have contributed to the presence of introduced species, in this respect contrasting with some families in the preceding list.

The total number of families in the catalogue is 103, and that of genera 409, there being, consequently, 3.16 species, varieties, and forms to a genus, 3.97 genera to a family, and 12.59 species, varieties, and forms to a family, as averages (the corresponding figures for the seventh edition of Gray's *Manual*, as compiled from p. 27, being 4.88, 6.37, and 31.11, respectively).

The abundance of the larger families as contrasted with their abundance in the region covered by Gray's *Manual* is shown in the following table.

	Percentage of the Coös flora	*Percentage of the Manual flora*
Compositae	.124	.134
Cyperaceae	.111	.095
Gramineae	.093	.087
Rosaceae	.071	.059
Ericaceae	.031	.019
Cruciferae	.027	.024
Polypodiaceae	.025	.016
Orchidaceae	.025	.015
Polygonaceae	.024	.014
Scrophulariaceae	.022	.027
Caryophyllaceae	.021	.016
Labiatae	.021	.026
Salicaceae	.020	.010
Leguminosae	.019	.042

From the foregoing table it appears that rather conspicuously over-represented in our area are the *Rosaceae*, *Ericaceae*, *Polypodiaceae*, *Orchidaceae*, *Polygonaceae*, and *Salicaceae*, while the family most strikingly under-represented, as might perhaps have been expected, is the *Leguminosae*. This disproportion becomes the more remarkable if we consider only native species, for in Coös County out of 973 native species, varieties, and forms, the *Leguminosae* can muster but 4 (*i. e.*, about .0041), while in the *Manual* range they show 168 out of 4179 natives (or .0402). In other words, in the range of the *Manual* as a whole, native *Leguminosae* are relatively nearly ten times as abundant as in Coös County. If it be further observed that of the four native species in the County two are limited to Shelburne, *Apios tuberosa* to Shelburne and Lancaster, and *Amphicarpa monoica* to Shelburne, Dalton, Lancaster, and Northumberland, it will be at once seen that nearly all our area is entirely lacking in native species of this

large family. The comparative absence of localities suitable for species of *Astragalus*, *Oxytropis*, and *Hedysarum* (which constitute the bulk of our northern *Leguminosae*) probably in part accounts for this situation, but doubtless analysis of other smaller families of a generally southern distribution would reveal conditions more or less parallel to that in the *Leguminosae*, perhaps without the same element of influence from the soil but with greater dependence upon temperature and other climatic conditions.

Detailed figures follow for all families appearing in our flora.

	Native				Introduced				Total
	Species	Varieties	Forms	Total	Species	Varieties	Forms	Total	
Polypodiaceae	26	4	2	32					32
Osmundaceae	3			3					3
Ophioglossaceae	7	2	1	10					10
Equisetaceae	8		3	11					11
Lycopodiaceae	9	6		15					15
Selaginellaceae	1			1					1
Isoëtaceae	1			1					1
Taxaceae	1			1					1
Pinaceae	12	1		13	1			1	14
Typhaceae	1	1		2					2
Sparganiaceae	4	1		5					5
Najadaceae	17			17					17
Juncaginaceae	1			1					1
Alismaceae	4		4	8					8
Gramineae	67	11	2	80	34	5	1	40	120
Cyperaceae	111	28	2	141	3			3	144
Araceae	3			3	1			1	4
Lemnaceae	1			1					1
Eriocaulaceae	1			1					1
Xyridaceae	1			1					1
Pontederiaceae	1			1					1
Juncaceae	17	6		23					23
Liliaceae	18			18	4			4	22
Iridaceae	2			2					2
Orchidaceae	29	1	2	32					32
Salicaceae	19	4		23	2	1		3	26
Myricaceae	2	1		3					3
Juglandaceae	1			1	1			1	2
Betulaceae	11	5		16					16
Fagaceae	2			2					2

	Native				Introduced				Total
	Species	Varieties	Forms	Total	Species	Varieties	Forms	Total	
Urticaceae	5			5	1			1	6
Santalaceae	1			1					1
Loranthaceae	1			1					1
Aristolochiaceae	1			1					1
Polygonaceae	13	1	1	15	15	1		16	31
Chenopodiaceae	2			2	9	1		10	12
Amaranthaceae					3			3	3
Illecebraceae	1			1					1
Aizoaceae					1			1	1
Caryophyllaceae	7	1		8	20			20	28
Portulacaceae	1			1	2			2	3
Nymphaeaceae	5	1		6					6
Ranunculaceae	18	1	1	20	4			4	24
Berberidaceae	1			1	1			1	2
Papaveraceae	1			1	3			3	4
Fumariaceae	2			2	2			2	4
Cruciferae	8	1		9	24	2		26	35
Sarraceniaceae	1			1					1
Droseraceae	2			2					2
Crassulaceae					2			2	2
Saxifragaceae	12			12	3			3	15
Hamamelidaceae	1			1					1
Rosaceae	61	12	3	76	16			16	92
Leguminosae	4			4	19	1	1	21	25
Linaceae					1			1	1
Oxalidaceae	2		1	3	1			1	4
Geraniaceae	2			2	1			1	3
Tropaeolaceae					1			1	1
Polygalaceae	1			1					1
Euphorbiaceae					8			8	8
Callitrichaceae	1			1					1
Empetraceae	2			2					2
Anacardiaceae	3		1	4					4
Aquifoliaceae	2	1		3					3
Celastraceae	1			1					1
Aceraceae	6			6					6
Balsaminaceae	2	1	1	4					4
Rhamnaceae	1			1					1
Vitaceae	2			2					2
Tiliaceae	1			1					1
Malvaceae					3			3	3
Hypericaceae	6			6	1			1	7

	Native				Introduced				Total
	Species	Varieties	Forms	Total	Species	Varieties	Forms	Total	
Cistaceae	1			1					1
Violaceae	15	2	1	18	3			3	21
Thymelaeaceae	1			1					1
Onagraceae	15	4	1	20	1			1	21
Haloragidaceae	4			4					4
Araliaceae	5			5					5
Umbelliferae	14			14	3			3	17
Cornaceae	4			4					4
Ericaceae	35	4	1	40	1			1	41
Diapensiaceae	1			1					1
Primulaceae	4			4	1			1	5
Oleaceae	2			2	1			1	3
Gentianaceae	4			4					4
Apocynaceae	3			3					3
Asclepiadaceae	1	1		2	1			1	3
Convolvulaceae	1			1	1			1	2
Boraginaceae	2			2	6			6	8
Verbenaceae	1			1					1
Labiatae	10	4	2	16	9	3		12	28
Solanaceae					3	1		4	4
Scrophulariaceae	14		1	15	13	1		14	29
Lentibulariaceae	5			5					5
Orobanchaceae	2			2					2
Plantaginaceae		1		1	4	1		5	6
Rubiaceae	10	2		12	1			1	13
Caprifoliaceae	13	1		14	2			2	16
Valerianaceae					1			1	1
Cucurbitaceae					2			2	2
Campanulaceae	2			2	3			3	5
Lobeliaceae	3			3	1	1		2	5
Compositae	75	22	4	101	54	4	2	60	161
Totals	808	131	34	973	298	22	4	324	

Grand total of native and introduced species, varieties, and forms 1297

Corresponding total in the seventh edition of Gray's *Manual* is 4885

Catalogue of Species, Varieties, and Forms growing spontaneously in Coös County.

Abbreviations used in the catalogue are the following:

Oakes = William Oakes
Deane = Walter Deane
Williams = E. F. Williams
M. = A. H. Moore
P. = A. S. Pease
F. & P. = M. L. Fernald & A. S. Pease

Specific and varietal names printed in bold-face type are native in Coös County; those printed in small capitals, though sometimes native elsewhere within the area covered by Gray's *Manual*, appear to be introduced or adventive within the limits of Coös County.

POLYPODIACEAE (FERN FAMILY).

POLYPODIUM [Tourn.] L. Polypody.

Polypodium virginianum L. (*P. vulgare* of *Manual*, not L.; *cf. Rhod.* 24 (1922), 141). Shaded rocks, frequent.—Pittsburg, First Lake, *P.* 10181 = *M.* 3555 (1907); (Dixville); (Colebrook); (Columbia); Stratford, *P.* 13563 (1912); Stark, *P.* 17442 (1919); (Northumberland); Milan, *P.* 13862 (1912); (Success); (Berlin); (Lancaster); (Jefferson); Randolph, *Williams* (1895), *P.* 81 (1902), *M.* 378 (1902), *M.* 1944 (1903), *P.* 4016, 4017 (1904); Shelburne, *Deane* (1883, 1916 (lower segments toothed)); Carroll, Crawford's, *Miss S. Minns* (no date); (Bean Purchase).

ADIANTUM [Tourn.] L. Maidenhair.

Adiantum pedatum L. Rich woods, somewhat local; more frequent in the Connecticut valley.—Pittsburg, near Camel's Rump, *P.* 19104 (1922); Stewartstown, *F. & P.* 16670 (1917); Colebrook, *P.* 10393 = *M.* 3948 (1907); Stratford, *P.* 13503, 13621 (1912); Northumberland, *P.* 16375 (1915); Lancaster, *P.* 12801 (1910), 19060 (1922); Mt. Prospect, *P.* 14226 (1913), *S. N. F. Sanford* (1914); Dalton, *P.* 16057 (1914), 16390 (1915), 17386 (1919); Millsfield, path to Camp Millsfield, *P.* 18169 (1921); Randolph, *Williams* (1894, 1895), *M.* 1136 (1903), *P.* 4024 (1904); (Gorham); Shelburne, *Deane* (1884, 1916).

PTERIDIUM Gled. Brake.

Pteridium aquilinum Kuhn, var. **latiusculum** (Desv.) Underwood (*Pteris aquilina* of *Manual*). Fields and thin woods, very common.—Pittsburg, First Lake, *P.* 10138=*M.* 3617 (1907); (Stewartstown); (Colebrook); (Columbia); (Millsfield); (Stratford); (Dummer); (Stark); (Northumberland); (Milan); (Success); (Berlin); (Kilkenny); (Lancaster); (Dalton); (Jefferson); Randolph, *Williams* (1894, 1895, 1896), *M.* 1454, 1455 (1903), *P.* 11220 (1908); (Gorham); Shelburne, *Deane* (1883, 1910, 1921); (Carroll); (Low & Burbank Grant); (Thompson & Meserve Purchase); Bean Purchase, *M.* 5074 (1913), *P.* 16041 (1914).

CRYPTOGRAMMA R. Br. Rock Brake.

Cryptogramma Stelleri (Gmel.) Prantl. Shaded calcareous cliffs, very local.—Colebrook, Beaver Falls, *P.* 10487=*M.* 3887 (1907).

ASPLENIUM L. Spleenwort.

Asplenium Trichomanes L. Shaded cliffs, rare.—Carroll, Crawford's, *Miss S. Minns* (no date); Shelburne, *Deane* (1885), Mine Brook, *P.* 11665 (1908).

Asplenium platyneuron (L.) Oakes. Rare.—Carroll, Crawford's, *Miss S. Minns* (no date).

ATHYRIUM Roth.

Athyrium acrostichoides (Sw.) Diels (*Asplenium acrostichoides* Sw.; *cf. Rhod.* 21 (1919), 178). Rich woods, frequent.—Pittsburg, First Lake, *Mrs. A. F. Stevens* (1895); Stewartstown, *P.* 16671 (1917); Colebrook, *P.* 11050 (1907); Stratford, *P.* 13603 (1912); Stark, *P.* 17447 (1919); Lancaster, *P.* 14225 (1913), 17819 (1920); Dalton, *P.* 17382 (1919); Millsfield, *P.* 18170 (1921); Randolph, *Williams* (1894, 1895), *P.* 4022, 4023 (1904); Gorham, *P.* 18225 (1921); Shelburne, *Deane* (1884).

Athyrium angustum (Willd.) Presl. (*Asplenium Filix-femina* of *Manual*, in part, not Bernh.; *cf. Rhod.* 19 (1917), 190). Lady Fern. Moist woods and hedgerows, common.—Pittsburg, First Lake, *M.* 3622 (1907); (Stewartstown); Colebrook, *M.* 3824 (1907); (Columbia); (Millsfield); (Stratford); (Success); (Milan); (Berlin); Lancaster, *P.* 19061 (1922); (Dalton); Jefferson, *H. A.*

Purdie (1905); Randolph, *Williams* (1896), *P.* 10650 (1907), *M.* 4084 (1907); (Gorham); Shelburne, *Deane* (1883, 1884); (Carroll); Low & Burbank Grant, Valleyway, 4000 ft., *P.* 14161 (1913); (Thompson & Meserve Purchase); Sargent Purchase, Huntington Ravine, 4000–4500 ft., *F.* & *P.* 16861, 16868 (1917); (Pinkham Grant); (Bean Purchase). Wherry (in *Rhod.* 22 (1920), 38) reports this species from the very summit of Mt. Washington.

Athyrium angustum (Willd.) Presl., var. **rubellum** (Gilbert) Butters (*Rhod.* 19 (1917), 193).—Randolph, *Williams* (1894), *P.* 17936 (1920).

POLYSTICHUM Roth.

Polystichum acrostichoides (Michx.) Schott. Christmas Fern. Rocky woods in rich soil, frequent.—Pittsburg, *P.* 10314 = *M.* 3521 (1907); Dartmouth College Grant, *P.* 16227 (1914); Stewartstown, *F.* & *P.* 16744 (1917); (Colebrook); (Columbia); (Millsfield); Stratford, *P.* 13597 (1912); (Stark); Northumberland, *P.* 16729 (1916); Milan, *P.* 13776 (1912); (Berlin); Lancaster, *P.* 16730 (1916); (Dalton); Jefferson, *P.* 16703 (1916); Randolph, *P.* 37 (1902), *M.* 1101 (1903); Gorham, *P.* 11478 (1908); Shelburne, *Deane* (1916); Carroll, *Miss Minns* (no date), *P.* 11447 (1908), 14388 (1913), 17430 (1919); (Low & Burbank Grant); Bean Purchase, *P.* 16023 (1914).

Polystichum acrostichoides (Michx.) Schott, f. **incisum** (Gray) Gilbert. Rocky woods, infrequent.—Stark, Devil's Slide, *P.* 17488 (1919); Lancaster, Mt. Prospect, *P.* 17230 (1918); Randolph, *P.* 17378 (1919).

Polystichum Braunii (Spenner) Fée. Braun's Holly Fern. Rich old woods, occasional.—Pittsburg, *P.* 10333 = *M.* 3498 (1907), near Camel's Rump, *P.* 19127 (1922); Dartmouth College Grant, *P.* 10510 (1907); Dixville, *E.* & *C. E. Faxon* (1887), *P.* 10563 (1907), 16527 (1915); Stewartstown, *P.* 16672 (1917); Colebrook, *P.* 10387 (1907); Millsfield, *P.* 18157 (1921); Stratford, *P.* 13481 (1912); Stark, Devil's Slide, *P.* 17486 (1919); Jefferson, *W. Boott* (1874), *P.* 11088 (1907); Randolph, *Williams* (1894, 1895), *J. R. Churchill* (no date), *M.* 1442 (1903), *P.* 4710 (1904), *H. A. Purdie* (1905), *M.* 3209 (1906); Carroll, Crawford's, *Miss Minns* (no date).

THELYPTERIS Schmidel. Shield Fern.
(*Aspidium* of *Manual; Dryopteris* Adans.)

Thelypteris palustris Schmidel. (*Aspidium Thelypteris* (L.) Sw. *cf. Rhod.* 23 (1921), 165). Boggy woods and pastures, very common.—Pittsburg, First Lake, *M.* 3563 (1907); Columbia, *M.* 3855 (1907); (Northumberland); Whitefield, Deane (1896); Jefferson, *P.* 10687 (1907); Randolph, *P.* 26 (1900), 14210 (1913); (Gorham); Shelburne, *Deane* (1885); Martin Location, *P.* 14344 (1913); (Bean Purchase).

Thelypteris noveboracensis (L.) Nieuwl. (*Aspidium noveboracense* (L.) Sw.; *cf. Rhod.* 21 (1919), 178). Moist woods, common.—Pittsburg, Second Lake, *P.* 10217 = *M.* 3420 (1907), First Lake, *Mrs. A. F. Stevens* (1895); (Stewartstown); (Columbia); (Millsfield); Whitefield, *Deane* (1896); Randolph, *P.* 4021 (1904); Gorham, *P.* 18217 (1921); Shelburne, *Deane* (1885), Shelburne Moriah, 3750 ft., *Miss A. W. Christensen & Miss C. A. Gauthier* (1917); Carroll, *Williams* (1894); (Low & Burbank Grant); (Thompson & Meserve Purchase); (Pinkham Grant); (Bean Purchase).

Thelypteris Phegopteris (L.) Slosson (*Phegopteris polypodioides* Fée; *cf. Rhod.* 21 (1919), 179). Rocky woods, very common.—Colebrook, *P.* 11070 = *M.* 382 (1907), *M.* 3977 (1907); (Columbia); (Millsfield); Stratford, *P.* 13450 (1912); (Stark); (Success); (Lancaster); (Dalton); Whitefield, *Deane* (1895); Jefferson, *Miss F. C. Prince* (1874); Randolph, *J. R. Churchill* (1889), *Williams* (1894), *M.* 1924 (1904), *P.* 9924 (1906); Shelburne, *Deane* (1883, 1914); Low & Burbank Grant, *Deane* (1917); (Pinkham Grant).

Thelypteris Dryopteris (L.) Slosson (*Phegopteris Dryopteris* (L.) Fée; *cf. Rhod.* 21 (1919), 179). Damp woods, very common.—Pittsburg, First Lake, *P.* 10152 = *M.* 3605 (1907); Dartmouth College Grant, *P.* 16270 (1914); (Stewartstown); Colebrook, *P.* 10473 (1907); (Columbia); (Millsfield); Stratford, *P.* 13538 (1912); (Stark); (Northumberland); (Success); (Berlin); (Lancaster); (Dalton); (Jefferson); Randolph, *Williams* (1894), *M.* 379 (1902), *P.* 9922 (1906); (Gorham); Shelburne, *Deane* (1883); Carroll, Crawford's, *Miss S. Minns* (no date); Thompson &

Meserve Purchase, Cape Horn, *Williams* (1903); Sargent Purchase, Tuckerman Ravine trail, *Williams* (1895); (Pinkham Grant); (Bean Purchase).

Thelypteris fragrans (L.) Nieuwl., var. **Hookeriana** Fern. (*Aspidium fragrans* (L.) Sw.; *cf. Rhod.* 25 (1923), 3–4). Fragrant Fern. Shaded cliffs, rare.—Dartmouth College Grant, Gorge of the Diamond, *P.* 16153 (1914); Berlin, rocks at Berlin Falls (station now destroyed), *W. G. Farlow* (1884), and *cf.* Farlow in *Appalachia*, 3 (1883), 251; Randolph, Ice Gulch, *T. O. Fuller and H. A. Purdie* (1895), *P.* 25 (1901), *M.* 1450 (1903); Gorham, Alpine Cascade, *C. E. Faxon* (1873), *Deane* (1884, 1885), *Williams* (1899), *P.* 2530 (1903), 11309 (1908); Shelburne, Mine Brook, *Deane* (1885), *P.* 11664 (1908); Pinkham Grant, Crystal Cascade, *J. Robinson* (1865, 1874), *E. Faxon* (1879), *L. F. Ward* (no date), *P.* 10715 (1907), and *cf.* Farlow, *l. c.*

Thelypteris marginalis (L.) Nieuwl. (*Aspidium marginale* (L.) Sw.; *cf. Rhod.* 21 (1919), 178). Rocky woods, frequent.—(Stewartstown); Colebrook, *P.* 10430 = *M.* 3819 (1907); (Columbia); Stratford, *P.* 13469 (1912); (Stark); (Northumberland); Milan, *P.* 13770 (1912); (Berlin); Lancaster, *P.* 14227, 14552 (1913); Dalton, *M.* 4415 (1908); *P.* 16408 (1915), 17398 (1919); Randolph, *P.* 4152 (1904), 12338 (1909); Gorham, *Deane* (1884); Shelburne, *Deane* (1884); (Carroll).

Thelypteris Goldiana (Hook.) Nieuwl. (*Aspidium Goldianum* Hook.; *cf. Rhod.* 21 (1919), 177). Rich woods, infrequent.—Pittsburg, First Lake, *Mrs. A. F. Stevens* (1895); Dixville, west of The Balsams, *P.* 10627 (1907); Colebrook, *W. Boott* (1855); Millsfield, path to Camp Millsfield, *P.* 18160 (1921); Lancaster, Mt. Prospect, *P.* 14513 (1913), 16918 (1917), north of Martin Meadow Pond, *P.* 17837 (1920).

Thelypteris cristata (L.) Nieuwl. (*Aspidium cristatum* (L.) Sw.; *cf. Rhod.* 21 (1919), 177). Boggy woods and pastures, common.—Pittsburg, *P.* 10173 (1907), *M.* 3641 (1907); (Stewartstown); (Columbia); (Millsfield); Stratford, *P.* 13464 (1912); (Stark); Northumberland, *F. & P.* 16602 (1917); Success, *P.* 16552 (1917); Lancaster, *P.* 17265 (1918); (Dalton); Whitefield, *P.* 14187 (1913); Jefferson, *P.* 16838 (1916); Randolph, *P.* 4053 (1904); Shelburne, *Deane* (1916); (Carroll).

Thelypteris cristata (L.) Nieuwl., var. **Clintoniana** (D. C. Eaton) Weatherby (*Aspidium cristatum* (L.) Sw., var. *Clintonianum* D. C. Eaton; *cf. Rhod.* 21 (1919), 177). Rare.—Jefferson, *P.* 12705 (1910).

Thelypteris spinulosa (O. F. Müll.) Nieuwl. (*Aspidium spinulosum* (O. F. Müll.) Sw.; *cf. Rhod.* 21 (1919), 178). Moist woods, less common than the following varieties.—Shelburne, *Deane* (1917); Low & Burbank Grant, Durand Ridge, *J. R. Churchill* (1889); Sargent Purchase, Tuckerman Ravine, *E. S. Hoar* (1858); Cutts Grant, Oakes Gulf, *Williams* (1895).

Thelypteris spinulosa (O. F. Müll.) Nieuwl., var. **intermedia** (Muhl.) Weatherby (*Aspidium spinulosum* (O. F. Müll.) Sw., var. *intermedium* (Muhl.) D. C. Eaton; *cf. Rhod.* 21 (1919), 178). Moist, especially deciduous, woods, common.—Pittsburg, First Lake, *P.* 10128 = *M.* 3616 (1907); Dartmouth College Grant, *P.* 16251 (1914); (Stewartstown); Colebrook, *M.* 3820 (1907); (Millsfield); Dummer, *P.* 16544 (1917); (Success); Whitefield, *Deane* (1896); (Jefferson); Randolph, *P.* 4206 (1904), 11657 (1908); Shelburne, *Deane* (1883, 1916); Carroll, Crawford's, *Miss S. Minns* (no date); Low & Burbank Grant, *P.* 17926 (1920).

Thelypteris spinulosa (O. F. Müll.) Nieuwl., var. **americana** (Fisch.) Nieuwl. (*Aspidium spinulosum* (O. F. Müll.) Sw., var. *dilatatum* (Hoffm.) Gray, f. *anadenium* Robinson; *cf. Rhod.* 21 (1919), 220). Moist woods; especially abundant in primeval spruce and fir forests.—Dixville Notch, *E. & C. E. Faxon* (1887); Erving Location, Dixville Peak, *P.* 16531 (1915); (Millsfield); (Stark); (Kilkenny); Randolph, *P.* 43 (1900), *M.* 1143 (1903); Low & Burbank Grant, Mt. Adams, *P.* 41 (1901), Mt. Madison, *P.* 42 (1901), 12066 (1909); (Thompson & Meserve Purchase); Bean Grant, Mt. Clinton, *E. & C. E. Faxon* (1879); Pinkham Grant, Crystal Cascade, *Deane* (1916).

CYSTOPTERIS Bernh. Bladder Fern.

Cystopteris bulbifera (L.) Bernh. Rich, especially calcareous, woods.—Clarksville, *P.* 10981 = *M.* 3717 (1907); Stewartstown, *P.* 10397 = *M.* 3904 (1907); Colebrook, *W. Boott* (1855), Beaver Falls, *P.* 10486 = *M.* 3904 (1907); Columbia, near Lime Pond, *P.* 10451 = *M.* 3841 (1907); Lancaster, Mt. Prospect, *P.* 17228 (1918).

Cystopteris fragilis (L.) Bernh. Shaded ledges, frequent.—Dartmouth College Grant, *P.* 12623, 12624 (1910); Dixville Notch, *Williams & E. M. Evans* (1906); Colebrook, Beaver Falls, *P.* 10395 = *M.* 3941, *P.* 10488 = *M.* 3893 (1907); Columbia, *P.* 10479 = *M.* 3920 (1907); Stark, *P.* 17446, 17452 (1919); Lancaster, *P.* 14272 (1913), 16736 (1916); Randolph, *Miss E. W. Cook* (1894), *Williams* (1896), *P.* 10821 (1907), 12876 (1910), 14488 (1913); Gorham, Alpine Cascade, *Deane* (1884); Shelburne, *Miss J. H. D. Stone* (1915), *Deane* (1915, 1916); Carroll, *Miss S. Minns* (no date), *P.* 17421 (1919); Pinkham Grant, Crystal Cascade, *P.* 10717 (1907).

WOODSIA R. Br.

Woodsia ilvensis (L.) R. Br. Dry cliffs and ledges, occasional.—Dartmouth College Grant, Gorge of the Diamond, *P.* 10514 (1907), 12606 (1910); Stark, Devil's Slide, *P.* 17440 (1919); Northumberland, Cape Horn, *P.* 16452 (1917); Lancaster, Mt. Prospect, *S. N. F. Sanford* (1914); Whitefield, Bray Hill, *P.* 14420 (1913); Berlin, *M.* 4479 (1908); Randolph, Ice Gulch, *J. R. Churchill* (1889), *Miss E. W. Cook* (1894), *P.* 10820 (1907), Mt. Black Crescent, *P.* 14489 (1913); Gorham, Alpine Cascade, *Deane* (1884, 1885), *P.* 2599 (1903); Shelburne, *W. G. Farlow* (1894), *Deane* (1910, 1914); Carroll, Crawford's, *Miss S. Minns* (no date); Sargent Purchase, Huntington Ravine, *M.* 174 (1901), *P.* 13895 (1912); Bean Grant, Mt. Webster, *P.* 11726 (1908); Hadley Grant, Hart Ledge, *P.* 16621 (1915); Pinkham Grant, Crystal Cascade, *P.* 10716 (1907).

Woodsia glabella R. Br. Shaded cliffs, very rare.—Gorham, Alpine Cascade, *Deane* (1884), *Williams* (1899), *P.* 11308 (1908), *cf.* Farlow in *Appalachia*, 3 (1883), 251.

DENNSTAEDTIA Bernh.

Dennstaedtia punctilobula (Michx.) Moore (*Dicksonia punctilobula* (Michx.) Gray). Hay-scented Fern. Pastures and woods, common.—Pittsburg, *P.* 10092 (1907); Dartmouth College Grant, *P.* 16225 (1914); (Dixville); (Stewartstown); Colebrook, *M.* 3811 (1907); (Columbia); (Millsfield); (Stratford); (Stark); (Northumberland); (Success); (Milan); (Berlin); (Kilkenny); (Lancaster); (Dalton); (Jefferson); Randolph, *Williams*

(1894), *P.* 64 (1902), *M.* 4451 (1908), *P.* 14208 (1913); (Gorham); Shelburne, *Deane* (1883); (Carroll); (Low & Burbank Grant); (Thompson & Meserve Purchase); Sargent Purchase, Huntington Ravine, 4000 ft., *F. & P.* 16867 (1917); (Pinkham Grant); (Bean Purchase).

ONOCLEA L.

Onoclea sensibilis L. Sensitive Fern. Meadows and low woods, common.—Pittsburg, *P.* 10136 = *M.* 3548 (1907); (Stewartstown); (Colebrook); (Columbia); (Millsfield); Stratford, *P.* 17653 (1919); (Stark); (Northumberland); (Milan); (Success); (Lancaster); (Dalton); (Jefferson); Randolph, *P.* 68 (1902), *M.* 1020 (1903), *P.* 14211 (1913); (Gorham); Shelburne, *Deane* (1883), *M.* 4169 (1908).

Onoclea sensibilis L., f. **obtusilobata** (Schk.) Gilbert. Similar localities, occasional.—Randolph, *Williams* (1897), *P.* 67 (1901), 68 (1902); Shelburne, *C. E. Faxon* (1872).

PTERETIS Raf.

Pteretis nodulosa (Michx.) Nieuwl. (*Onoclea Struthiopteris* of *Manual*, not Hoffm.; *Matteuccia Struthiopteris* of Britton & Brown, not Todaro; *cf. Rhod.* 21 (1919), 178–179). Ostrich Fern. Alluvial soil, frequent, especially in the larger valleys.—Pittsburg, *P.* 10329 = *M.* 3502 (1907); (Clarksville); (Stewartstown); Colebrook, *M.* 4033 (1907); (Columbia); Millsfield, *P.* 18167 (1921); Stratford, *P.* 13577 (1912); Cambridge, Androscoggin valley, *Williams* (1895); (Northumberland); (Berlin); (Lancaster); Jefferson, *Williams* (1894), *P.* 16874 (1916); Randolph, *P.* 10525 (1907), *M.* 4085 (1907); Gorham, *P.* 11481 (1908); Shelburne, *W. G. Farlow* (1891), *Miss L. Davenport* (1907), *Deane* (1907); Carroll, *P.* 14362 (1913); Low & Burbank Grant, *P.* 17929 (1920).

OSMUNDACEAE (FLOWERING FERN FAMILY).

OSMUNDA [Tourn.] L.

Osmunda regalis L., var. **spectabilis** (Willd.) Gray (*Rhod.* 21 (1919), 179). Royal Fern. Swamps and wet shores, not infrequent.—Pittsburg, Second Lake, *P.* 10252 = *M.* 3517 (1907); (Stewartstown); Colebrook, *M.* 3799 (1907); Columbia, Lime

Pond, *F.* & *P.* 16793 (1917); Cambridge, Lake Umbagog, *P.* 17513 (1919), 18184 (1921); Northumberland, *P.* 16458, 16642 (1917), 17248 (1918); Milan, *P.* 13858 (1912); Berlin, *Deane* (1883); Lancaster, Clark Pond, *P.* 12335 (1909); Whitefield, *M.* 4396 (1908); (Jefferson); Randolph, *P.* 4114 (1904); (Gorham); Shelburne, *Deane* (1916); Martin Location, *P.* 14257 (1913).

Osmunda Claytoniana L. Interrupted Fern. Low ground, common.—Pittsburg, First Lake, *P.* 10966 = *M.* 3634 (1907); (Stewartstown); (Columbia); Stratford, *P.* 13500 (1912); (Milan); (Success); Berlin, *Deane* (1883); (Lancaster); (Jefferson); Randolph, *M.* 1021 (1903), *P.* 12077 (1909); (Gorham); Shelburne, *Deane* (1884); Carroll, *P.* 17420 (1919); Low & Burbank Grant, Camp Placid, 4000 ft., *P.* 12098 (1909); (Sargent Purchase); (Bean Purchase).

Osmunda cinnamomea L. Cinnamon Fern. Low ground, common.—(Pittsburg); (Stewartstown); (Columbia); (Millsfield); Stratford, *P.* 13523 (1912); (Stark); Northumberland, *P.* 16446 (1917); (Milan); (Success); (Dalton); (Jefferson); Randolph, *P.* 70 (1902), *M.* 1019 (1903), *P.* 16072 (1914), with sterile pinnae at the top of the fertile frond; (Gorham); Shelburne, *Deane* (1915).

OPHIOGLOSSACEAE (ADDER'S TONGUE FAMILY).

OPHIOGLOSSUM [Tourn.] L. Adder's Tongue.

Ophioglossum vulgatum L. Boggy meadows and pastures and sometimes on dry hillsides, frequent.—Stewartstown, *P.* 19111 (1922); Millsfield, *P.* 18163 (1921); Dixville, *Williams* & *E. M. Evans* (1906); Colebrook, *P.* 10433 = *M.* 3787 (1907); Milan, *P.* 13954 (1912); Lancaster, *P.* 14200 (1913), 17639 (1917); Dalton, *P.* 16426 (1915); Whitefield, *Deane* (1895), *P.* 17330 (1918); Randolph, *E.* & *C. E. Faxon* (1886), *Williams* (1894, 1896), *P.* 21 (1902), 12061 (1909); (Gorham).

BOTRYCHIUM Sw. Moonwort.

Botrychium simplex E. Hitchcock. Open gravelly banks, commonly with *Danthonia spicata* and *Polytrichums*, locally abundant.—Colebrook, near Kidderville, *P.* 12576 (1910), near Beaver Falls, *F.* & *P.* 16595 (1917); Milan, Fogg Hill, *P.* 14126,

14127 (1913); Randolph, *P.* 10062 (1907), 11184 (1908), 17092, 17102 (1918).

Botrychium simplex E. Hitchcock, var. **compositum** (Lasch) Milde. Dry fields, rare.—Milan, near Upper Ammonoosuc River, *P.* 14122 (1913).

Botrychium angustisegmentum (Pease & Moore) Fernald (*B. lanceolatum* (Gmel.) Ångstroem, var. *angustisegmentum* Pease & Moore; *cf. Rhod.* 17 (1915), 87). Rich woods, often with *B. ramosum* and *B. virginianum*, infrequent.—Randolph, *Miss E. Richards* (1897), *Williams* (1897), *P.* 6 (1900), *M.* 4040 (1907), *P.* 10495 (1907), 14158 (1913); Shelburne, *Deane* (1884).

Botrychium ramosum (Roth) Aschers. Rich woods and also in gravelly pastures and hillsides, frequent.—Colebrook, *P.* 10491 (1907); Columbia, *P.* 14070 (1912); Stratford, Percy Peaks, *P.* 12859 (1910); Northumberland, *P.* 13627 (1912); Lancaster, *S. N. F. Sanford* (1914), *P.* 19057 (1922); Dalton, *P.* 17408 (1919); Whitefield, *Deane* (1895); Jefferson, *H. A. Purdie* (1905), *P.* 14419 (1913), 18073 (1921); Randolph, *E. & C. E. Faxon* (1886), *Williams* (1894, 1895, 1896), *P.* 14 (1900), 12 (1901), *H. A. Purdie* (1905), *P.* 10189, 10496 (1907), *M.* 4039 (1907), *P.* 14207 (1913); Shelburne, *C. E. & W. Faxon* (no date), *Deane* (1884, 1910); Carroll, Crawford's, *C. E. Faxon* (1878); Bean Purchase, North Baldface, *P.* 16024 (1914).

Botrychium dissectum Spreng. (*B. obliquum* Muhl., var. *dissectum* (Spreng.) Clute; *cf. Rhod.* 23 (1921), 151). Pastures and open woods, infrequent.—Shelburne, *Deane* (1914, 1916); Martin Location, *P.* 14330 (1913).

Botrychium dissectum Spreng., f. **obliquum** (Muhl.) Fern. (*B. obliquum* Muhl.; *cf. Rhod.* 23 (1921), 151). Pastures and open woods, frequent.—(Stewartstown); Colebrook, *F. & P.* 16955 (1917); Millsfield, *P.* 18164 (1921); Stratford, *P.* 13539 (1912); Northumberland, *F. & P.* 17062 (1917); Lancaster, *P.* 17541 (1919); Dalton, *P.* 11494 (1908); (Whitefield); Randolph, *P.* 19815 (1907); Gorham, *P.* 16905 (1916); Shelburne, *Deane* (1902, 1914); Martin Location, *P.* 14332 (1913).

Botrychium ternatum (Thunb.) Sw., var. **intermedium** D. C. Eaton. Dry pastures, frequent.—Clarksville, *P.* 19110 (1922);

Dartmouth College Grant, *P.* 16151 (1914); Colebrook, *P.* 10434 = *M.* 3788 (1907); Columbia, *F.* & *P.* 16588 (1917); Northumberland, *P.* 17291 (1918); Milan, *P.* 14066 (1912); Lancaster, *P.* 14437 (1913), *S. N. F. Sanford* (1914); Dalton, *M.* 4444 (1908), *P.* 16427 (1915); Jefferson, *P.* 16831 (1916); Randolph, *E.* & *C. E. Faxon* (1886), *Williams* (1895, 1896), *P.* 17 (1900), 18 (1902), *M.* 1410 (1903), *P.* 9900 (1906), 5417 (1906), *Miss E. Locke* (1910), *P.* 17234 (1918); Gorham, *P.* 16096 (1916); Shelburne, *E. Faxon* (no date), *Deane* (1884, 1885, 1902, 1914, 1916).

Botrychium ternatum (Thunb.) Sw., var. **rutaefolium** (A. Br.) D. C. Eaton. Dry pastures and open woods, occasional.—Pittsburg, First Lake, *P.* 10937 (1907); Randolph, *P.* 18088 (1920); Gorham, *P.* 12823 (1910); Shelburne, *Deane* (1884); Carroll, Stanley Slide, Owl's Head, *P.* 19 (1902).

Botrychium virginianum (L.) Sw. (including var. *europaeum* Ångstroem and var. *intermedium* Butters). Rattlesnake Fern. Rich woods, frequent.—Pittsburg, Third Lake, *P.* 10158 (1907); Dartmouth College Grant, *P.* 16206 (1914); Clarksville, *M.* 3714 (1907); Stewartstown, *F.* & *P.* 16841 (1917); Colebrook, *F.* & *P.* 16665, 16839 (1917); Columbia, *P.* 10868 = *M.* 3869 (1907); Stratford, *P.* 13520 (1912); Lancaster, *P.* 14321 (1913), *S. N. F. Sanford* (1914); Dalton, *P.* 16056 (1914); Whitefield, *Deane* (1895, 1896); Jefferson, *P.* 16720 (1916); Randolph, *Williams* (1894), *P.* 15 (1900), *M.* 951 (1903), *P.* 14444 (1913); Shelburne, *Deane* (1884, 1916).

EQUISETACEAE (HORSETAIL FAMILY).

EQUISETUM [Tourn.] L. Horsetail.

Equisetum arvense L. Open ground, wet or dry, very common and variable.—Pittsburg, First Lake, *P.* 11059 = *M.* 3592, *P.* 10142 = *M.* 3640 (1907); Clarksville, *P.* 10980 = *M.* 3718 (1907); Stewartstown, *P.* 10407 = *M.* 3969, *P.* 10403 = *M.* 3961 (1907), *F.* & *P.* 16797 (1917); Colebrook, *P.* 10474 = *M.* 3905, *P.* 10911, 10914 = *M.* 4002, 4013 (1907); *M.* 3797 (1907); (Columbia); (Millsfield); Stratford, *P.* 13610 (1912); (Success); (Lancaster); (Jefferson); Randolph, *Williams* (1897), *P.* 10859 (1907), *M.*

4202 (1908); (Gorham); Shelburne, *Deane* (1909); (Carroll); (Pinkham Grant).

Equisetum pratense Ehrh. Alluvial soil, especially in calcareous regions, local.—Stewartstown, *F. & P.* 10798 (1917), *P.* 17696 (1919); Colebrook, near Beaver Falls, *F. & P.* 16775 (1917); Lancaster, bank of Connecticut River, *P.* 17109 (1918).

Equisetum sylvaticum L., var. **pauciramosum** Milde (*Rhod.* 20 (1918), 131). Moist woods, common.—Pittsburg, First Lake, *P.* 10182 = *M.* 3571 (1907); Dartmouth College Grant, *P.* 14382 (1913); Randolph, *P.* 93 (1900); Shelburne, *Deane* (1919).

Equisetum sylvaticum L., var. **pauciramosum** Milde, f. **multiramosum** Fern. (*Rhod.* 20 (1918), 131). Similar localities, common.—Stratford, *P.* 13486 (1912); Jefferson, *P.* 16889 (1917); Randolph, *P.* 10037 (1907); Shelburne, *Deane* (1910, 1919).

Equisetum palustre L. Alluvial soil, infrequent.—Errol, outlet of Akers Pond, *F. & P.* 16987 (1917).

Equisetum litorale Kühlewein. Wet sandy shores.—Stewartstown, Connecticut River, *F. & P.* 17015 (1917); Shelburne, *Deane* (1884).

Equisetum limosum L. (*E. fluviatile* L., *cf. Rhod.* 23 (1921), 45). Shallow water and muddy banks, common.—Pittsburg, Second Lake, *P.* 10264 = *M.* 3418 (1907), First Lake, *M.* 3549 (1907); Colebrook, *P.* 10935 = *M.* 3996 (1907); Randolph, *P.* 92 (1900).

Equisetum limosum L., f. **minus** A. Br. (*Rhod.* 23 (1921), 45). Localities like the last.—Randolph, *P.* 10051 = *M.* 3276 (1907).

Equisetum limosum L., f. **verticillatum** Doell. (*Rhod.* 23 (1921), 46). Situations with the typical form.—Stewartstown, *F. & P.* 16828 (1917); Northumberland, *P.* 13559 (1912); Shelburne, *Deane* (1915).

Equisetum hyemale L., var. **affine** (Engelm.) A. A. Eaton. Scouring Rush. Alluvial banks, somewhat local.—Colebrook, near Beaver Falls, *P.* 10409 = *M.* 3901, *F. & P.* 17023 (1917); Stratford, *P.* 17672 (1919); Lancaster, Coös Junction, *P.* 12113 (1909); Dalton, Dalton Mt., *P.* 16088 (1914); Gorham, *Williams*

(1903), *P.* 10806 (1907), *Deane* (1909), *P.* 16006 (1914), *Deane* (1915).

Equisetum scirpoides Michx. Shaded banks in the Connecticut and Androscoggin valleys, local.—Stewartstown, *P.* 10222 = *M.* 3395 (1907), *F. & P.* 16784 (1917); Colebrook, Beaver Falls, *P.* 10475 = *M.* 3888 (1907); Stratford, *P.* 13512 (1912); Dummer, Pontook Falls, *P.* 16527 (1917); Gorham, *P.* 12211 (1909); Shelburne, *Deane* (1884), *E. Faxon* (no date), *W. G. Farlow* (1894).

LYCOPODIACEAE (CLUB MOSS FAMILY).

LYCOPODIUM [Rupp.] L. Club Moss.

Lycopodium Selago L. (including var. *appressum* Desv.). Rarely on hillside pastures in the upper Connecticut valley, abundant at Dixville Notch and on exposed ledges and gravel above tree-line in the White Mountains.—Stewartstown, pasture south of West Stewartstown, *P.* 10148 = *M.* 3691 (1907); Colebrook, Lombard Hill, *F. & P.* 17033 (1917); Dixville Notch, *P.* 18148 (1921); Low & Burbank Grant, Mt. Madison, *A. P. Chadbourne* (1884), *P.* 12190 (1909); Thompson & Meserve Purchase, Great Gulf, *E. & C. E. Faxon* (1879), *Williams* (1895), Mt. Clay, *Williams* (1896), Cape Horn, *Williams* (1896); Sargent Purchase, Mt. Washington, *F. Boott* (1816), *A. P. Garber* (1874), *W. F. Flint & J. H. Huntington* (1876), *J. A. Allen* (1878), *J. F. Collins* (1891), *Williams* (1893), *J. R. Churchill* (1895), *P.* 98 (1900), *C. E. Faxon* (no date), Tuckerman Ravine, *M.* 4856 (1910); Bean Grant, Mt. Webster, *P.* 11740 (1908); Hadley Grant, Mt. Crawford, *P.* 11730 (1908). White Mts., *Oakes* (no date).

Lycopodium lucidulum Michx. Cool damp woods, common.—Pittsburg, First Lake, *P.* 10123 = *M.* 3609 (1907); (Clarksville); Stewartstown, *F. & P.* 16617 (1917); (Millsfield); Stratford, *P.* 13509 (1912); (Stark); (Dalton); Jefferson, *W. Boott* (1874), *P.* 11087 (1907); Randolph, *Williams* (1893), *P.* 4065 (1904), *M.* 4258 (1908); Shelburne, *Deane* (1883), *W. G. Farlow* (1893), *P.* 11771 = *M.* 4328 (1908), *Deane* (1916); (Low & Burbank Grant); (Thompson & Meserve Purchase); Martin Location, *P.* 14357 (1913); (Bean Purchase).

Lycopodium inundatum L. Moist sandy soil, frequent.—Pittsburg, Second Lake, *P.* 10248 = *M.* 3437 (1907), *P.* 17673 (1919); Cambridge, Lake Umbagog, *P.* 18180 (1921); Milan, *P.* 13873 (1912); Berlin, Head Pond, *P.* 19065 (1922); Success, *P.* 10643 (1907); Lancaster, *P.* 12002½ (1909); Randolph, *P.* 4076, 4077 (1904), 9899 (1906), *M.* 4203 (1908); Shelburne, *Deane* (1914); Carroll, Stanley Slide, *P.* 108 (1902); Low & Burbank Grant, *P.* 16358 (1915); Thompson & Meserve Purchase, Carriage Road, *P.* 10597 (1907). White Mts., *Oakes* (no date), *Tuckerman* (no date).

Lycopodium annotinum L. Woods, and, above tree-line, open slopes, frequent.—Pittsburg, *Mrs. A. F. Stevens* (1895); Dalton, *P.* 17838 (1920); Jefferson, Mt. Starr King, *P.* 11098 (1907); Shelburne, *C. E. Faxon* (1902), *Deane* (1915); Thompson & Meserve Purchase, Mt. Jefferson, 5000 ft., *W. R. Davis* (1902), Cape Horn, *Williams* (1903); Sargent Purchase, Mt. Washington, *W. P. Rich* (1880); Cutts Grant, Oakes Gulf, *Williams* (1895); Bean Purchase, *P.* 17930 (1920). White Mts., *Tuckerman* (no date), *W. H. Manning* (1881).

Lycopodium annotinum L., var. **acrifolium** Fern. (*Rhod.* 17 (1915), 124). Similar localities, and commoner at lower altitudes.—Clarksville, *F. & P.* 17051 (1917); Colebrook, *P.* 10443 = *M.* 3880 (1907); Randolph, *Williams* (1893), *P.* 17607 (1919); Shelburne, *W. G. Farlow* (1893), *Miss L. M. Brown* (1915). White Mts., *A. Gray* (1842); Notch, *W. Boott* (1853).

Lycopodium annotinum L., var. **pungens** Desv. Exposed slopes, especially in the alpine and subalpine regions, common.—Stratford, Percy Peaks, *P.* 12745 (1910); Jefferson, Mt. Starr King, *Deane* (1897); Low & Burbank Grant, Mt. Madison, *A. P. Chadbourne* (1884), *P.* 12090 (1909); Thompson & Meserve Purchase, Mt. Madison, *P.* 3221 (1900), Mt. Adams, *P.* 100 (1901), Northern Peaks, *M.* 1075 (1903), 4603 (1909), Mt. Clay, *W. Boott* (1855), Great Gulf, *W. Boott* (1855), Mt. Washington, *Deane* (1884), Cape Horn, *Williams* (1903); Sargent Purchase, Mt. Washington, *J. A. Allen* (1878), *C. G. Pringle* (1880), *Williams* (1893), Alpine Garden, *Williams* (1895, 1901), *W. W. Eggleston* (1899). Alpine region, *Oakes* (no date).

Lycopodium clavatum L. Dry woods and pastures, common.—Pittsburg, First Lake. *P.* 10139 = *M.* 3569 (1907); (Clarksville); (Colebrook); (Columbia); (Millsfield); Stratford, *P.* 13544 (1912); (Stark); (Northumberland); (Dalton); Jefferson, *W. Boott* (1873), *P.* 11086 (1907); Randolph, *Williams* (1893), *P.* 101 (1900), *M.* 380 (1902), *Mrs. G. F. Moore* (1905); Shelburne, *Deane* (1883), *W. G. Farlow* (1893), *J. W. Blankinship* (1894), *M.* 4327 (1908), *Deane* (1913); (Low & Burbank Grant); Thompson & Meserve Purchase, Cape Horn, *Williams* (1901); Bean Purchase, *M.* 5070 (1913).

Lycopodium clavatum L., var. **megastachyon** Fern. & Bissell (*Rhod.* 12 (1910), 53). Dry pastures and moist banks, frequent.—Colebrook, *P.* 11078 = *M.* 3796 (1907), *P.* 10485 = *M.* 3891 (1907); Northumberland, *P.* 13496 (1911); Dalton, *P.* 16409 (1915); Jefferson, *P.* 11085 (1907); Randolph, *P.* 105 (1900), 106 (1902), *M.* 1435a (1903); Gorham, *P.* 18223 (1921); Shelburne, *Deane* (1902), *P.* 11760 (1908), *Deane* (1913); Thompson & Meserve Purchase, Carriage Road, *B. L. Robinson* & *E. F. Williams* (1901), *P.* 12838, 12839 (1910); Hadley Grant, Mt. Crawford, *P.* 11706 (1908).

Lycopodium clavatum L., var. **monostachyon** Grev. & Hook. (*Rhod.* 12 (1910), 55). Only one station in our area.—Thompson & Meserve Purchase, Cape Horn, *B. L. Robinson* & *E. F. Williams* (1901).

Lycopodium obscurum L. Woods, frequent.—Pittsburg, First Lake, *P.* 10101 = *M.* 3541 (1907); (Dixville); (Stewartstown); (Stark); Milan, *P.* 13721 (1912); (Success); (Berlin); Randolph, *P.* 4055 (1904); Shelburne, *Deane* (1883, 1913); (Carroll); (Thompson & Meserve Purchase).

Lycopodium obscurum L., var. **dendroideum** (Michx.) D. C. Eaton. Woods, common.—Dartmouth College Grant, *P.* 16170 (1914); (Columbia); Stratford, *P.* 13543 (1912); Whitefield, *Deane* (1896); Carroll, Crawford's, *Miss S. Minns* (no date); Randolph, *Williams* (1893), *M.* 1547 (1904); Shelburne, *Deane* (1902).

Lycopodium sabinaefolium Willd., var. **sitchense** (Rupr.) Fern. (*L. sitchense* Rupr.; *cf. Rhod.* 25 (1923), 166). Pastures, occa-

sional; one alpine station.—Colebrook, Lombard Hill, *P.* 10382 = *M.* 3935 (1907), *F. & P.* 16947 (1917); Milan, dry pasture 4 miles south of West Milan, *P.* 13757 (1912); Gorham, gravelly soil by railway near base of Pine Mtn., *P.* 17925 (1920); Sargent Purchase, Alpine Garden, *W. W. Eggleston* 2425 (1901).

Lycopodium complanatum L. Dry woods, frequent.—Pittsburg, *P.* 17686 (1919); Colebrook, *P.* 10457 = *M.* 3835, 3881 (1907); Columbia, *P.* 11081 = *M.* 3830 (1907); Randolph, *P.* 10814 (1907), 17324 (1918), 18130 (1921) with 1-spiked peduncles; Shelburne, *P.* 11157 = *M.* 4150 (1908), *Deane* (1917); Thompson & Meserve Purchase, Cape Horn, *Williams* (1903), *P.* 12731 (1910); Hadley Grant, Mt. Hope, *P.* 16449 (1915).

Lycopodium complanatum L., var. **flabelliforme** Fern. Ground Pine. Dry woods and pastures, common.—Pittsburg, *P.* 10141 = *M.* 3637 (1907); Clarksville, *P.* 19109 (1922); Dartmouth College Grant, *P.* 16183 (1914); Colebrook, *M.* 3879 (1907); Columbia, *M.* 3829 (1907); (Millsfield); Stratford, *P.* 13540 (1912); (Lancaster); Dalton, *P.* 11595 = *M.* 4384 (1908); (Jefferson); Randolph, *M.* 391 (1903); *P.* 4103 (1904); Shelburne, *Deane* (1883); Carroll, Crawford's, *Miss S. Minns* (no date); (Sargent Purchase).

Lycopodium tristachyum Pursh. Dry pastures and thin woods, frequent.—Colebrook, *P.* 10381 = *M.* 3936 (1907); Milan, *P.* 13810 (1912); Berlin, *C. E. Faxon* (no date), *P.* 16507 (1915); Jefferson, Jefferson Junction, *P.* 12806 (1910); Randolph, *P.* 11186 (1908); Shelburne, *P.* 11151, 11142 = *M.* 4167 (1908); Hadley Grant, Mt. Crawford, *P.* 11709 (1908).

SELAGINELLACEAE.

SELAGINELLA Beauv.

Selaginella rupestris (L.) Spring. Dry open ledges, very local.—Berlin, hill above Jasper Cave, *P.* 14508 (1913); Hadley Grant, Hart Ledge, *P.* 16625 (1915).

ISOËTACEAE (QUILLWORT FAMILY).

ISOËTES L. Quillwort.

Isoëtes echinospora Dur., var. **Braunii** (Dur.) Engelm. Muddy shores, occasional.—Columbia, Fish Pond, *P.* 13970 (1912);

Carroll, Saco Lake, *E. & C. E. Faxon* (1893); Pinkham Grant, Dismal Pool, *E. & C. E. Faxon* (1882); Sargent Purchase, larger of the Lakes of the Clouds, *G. S. Miller, Jr., Williams* (1893).

TAXACEAE (YEW FAMILY).

TAXUS [Tourn.] L. Yew.

Taxus canadensis Marsh. American Yew; Ground Hemlock. Cold, especially alluvial, woods, common.—Pittsburg, near Third Lake, *P.* 10299 = *M.* 3490 (1907); (Stewartstown); Columbia, *P.* 17715 (1919); Stratford, *P.* 13484 (1912); (Dummer); (Stark); Milan, *P.* 13713 (1912); Lancaster, *P.* 12368 (1909); (Dalton); (Whitefield); Jefferson, *Williams* (1895). *P.* 10634 (1907); Randolph, *Williams* (1897), *M.* 1051, 1435 (1903), *P.* 11579 (1908); Gorham, *Williams* (1897), *P.* 11438 (1908); Shelburne, *Deane* (1883, 1916); Martin Location, *Deane* (1882).

PINACEAE (PINE FAMILY).

PINUS [Tourn.] L. Pine.

Pinus Strobus L. White Pine. Well distributed but seldom abundant and rarely reaching high elevations.—Pittsburg, River Road, *M.* 3675 (1907), near Canaan line, *P.* 10946 = *M.* 3737 (1907); (Stewartstown); Colebrook, *M.* 3903 (1907); (Columbia); Errol, *P.* 10503 (1907); (Stratford); (Cambridge); (Stark); (Northumberland); Milan, *P.* 17321 (1918); Success, *M.* 4313 (1908); (Berlin); (Lancaster); Dalton, *M.* 4391 (1908); Whitefield, *Deane* (1895), *M.* 4434 (1908); (Jefferson); Randolph, *Williams* (1897), *M.* 1436 (1903), *P.* 12178 (1909); (Gorham); Shelburne, *Deane* (1882, 1883), *M.* 4145 (1908), *Deane* (1914); (Low & Burbank Grant); (Bean Purchase); Hadley Grant, Mt. Crawford, *P.* 11734 (1908).

Pinus rigida Mill. Pitch Pine. Sandy soil, very local.—Shelburne, *Deane* (1882, 1902, 1909).

Pinus Banksiana Lamb. Gray Pine; Scrub Pine. Shores of Lake Umbagog, very local.—Errol, Metallak Island, *W. Brewster* (1896), *H. A. Purdie* (1897), Pine Point, *P.* 10618 (1907); Cambridge, points near Lakeside, *W. Brewster* (1896), *P.* 16529 (1915).

Pinus sylvestris L. Scotch Pine. Rarely adventive.—Shelburne, *Deane* (1921).

Pinus resinosa Ait. Red Pine. Open ledges and sandy woods, frequent in the southern part of the County but rare at higher elevations and northward.—Stratford, Percy Peaks, *P.* 12739 (1910); (Stark); Northumberland, *P.* 12216 (1909), Cape Horn, *P.* 16447 (1917); Berlin, Mt. Forist, *P.* 16098 (1914); Dalton, Forest Lake, *P.* 11453 = *M.* 4434 (1908), *P.* 14578, 14277 = *M.* 5070 (1913); Whitefield, *P.* 14277 (1913); Carroll, *Miss S. Minns* (no date), Stanley Slide, *P.* 17938 (1920) one tree; Jefferson, *P.* 12911 (1910); Gorham, *P.* 11452 (1908); Shelburne, *Deane* (1882), *M.* 4126 (1908), *Deane* (1916); Bean Purchase, Wild River valley, *P.* 16053 (1914); Hadley Grant, Mt. Hope, *P.* 16455 (1915).

LARIX [Tourn.] Mill. Larch.

Larix laricina (DuRoi) Koch. American Larch; Tamarack; Hackmatack. Swamps and boggy meadows, common. Also in isolated cases as a dwarf shrub at or above tree-line.—Pittsburg, near Third Lake, *M.* 3494 (1907), *P.* 11003 (1907); (Stewartstown); Colebrook, *P.* 10841 = *M.* 4028 (1907); Columbia, *M.* 3838 (1907); Errol, *Williams* (1895); Stratford, *P.* 13472 (1912); (Stark); (Northumberland); Milan, *Williams* (1895); Success, *P.* 11619 (1908); (Berlin); (Lancaster); Dalton, *M.* 4362 (1908); Whitefield, *Deane* (1895); (Carroll); Jefferson, *P.* 16494 (1917); Randolph, *Williams* (1897), *M.* 1145 (1903), 3289 (1907), *P.* 11136 (1908); Gorham, *Deane* (1884); Shelburne, *Deane* (1883). For the scrub form there may be cited: Low & Burbank Grant, Watson Path, *M.* 1430 (1903), *P.* 3020 (1903), Nowell Ridge, *P.* 12315 (1909), Rockside Trail, *P.* 12735 (1910); Thompson & Meserve Purchase (rep. from Mt. Adams, 5000 ft., *Miss C. M. Endicott* (1894); *cf. Plants of Mt. Washington, N. H.* (1920), 2), Cape Horn, *Williams* (1903); Sargent Purchase, Alpine Garden, *P.* 12533 (1909); Bean Grant, Mt. Webster, *P.* 11777 (1908); Hadley Grant, Mt. Crawford, *P.* 11751 (1908).

PICEA Link. Spruce.

Picea canadensis (Mill.) BSP. White Spruce; Cat Spruce. Pastures, less often in woods, rare southward but increasingly

common from Jefferson and Milan northward.—Pittsburg, First Lake, *P.* 10150 = *M.* 3537 (1907); Dartmouth College Grant, *P.* 16141 (1914); (Stewartstown); Colebrook, *P.* 10413 = *M.* 3889 (1907); (Columbia); Errol, *Williams* (1895); Stratford, *P.* 13473 (1912); (Stark); (Northumberland); Milan, *P.* 10536 (1907), 13882 (1916); Success, *P.* 10637 (1907); (Berlin); (Lancaster); (Dalton); Whitefield, *Deane* (1894, 1896), *P.* 14276 (1913); Jefferson, *P.* 10684 (1907); Randolph, *E. Faxon* (1886), *M.* 4037 (1907), *P.* 10942 (1907); Shelburne, *Deane* (1882, 1913), *Miss A. W. Christensen* (1917); (Bean Purchase).

Picea rubra (DuRoi) Dietr. Red Spruce. The prevailing evergreen tree of the County at all elevations.—Pittsburg, Second Lake, *P.* 10350 = *M.* 3468 (1907); (Dartmouth College Grant); (Dix Grant); (Wentworth Location); (Stewartstown); (Colebrook); (Erving Location); (Columbia); (Millsfield); (Errol); (Odell); (Stratford); (Cambridge); (Dummer); (Stark); (Milan); (Success); (Berlin); (Kilkenny); (Lancaster); Whitefield, *Deane* (1896); (Jefferson); Randolph, *Williams* (1897), *M.* 1010, 1029 (1903), *Mrs. G. F. Moore* (1905), *P.* 11327 (1908); (Gorham); Shelburne, *Deane* (1882); (Carroll); (Low & Burbank Grant); Thompson & Meserve Purchase, Mt. Madison, *M.* 1432 (1903), Carriage Road, *Williams* (1896); Sargent Purchase, Alpine Garden, *Williams* (1896, 1898); (Bean Grant); (Pinkham Grant); Bean Purchase, Imp Mtn., *P.* 16859 (1917).

Picea mariana (Mill.) BSP. Black Spruce. Cold bogs and lake borders, also common in scrub form at tree-line.—(Stark); Success, Mt. Success, scrub form, *P.* 11209 = *M.* 4113 (1908); Lancaster, *Deane* (1896); Whitefield, *Deane* (1895); (Jefferson); Randolph, Ice Gulch, *P.* 11496 (1908), 16646 (1917); Shelburne, Mt. Shelburne Moriah, *Miss A. W. Christensen* & *Miss C. A. Gauthier* (1917); Thompson & Meserve Purchase, Mt. Madison, *P.* 10227 = *M.* 3343 (1907), Carriage Road, *Williams* (1898); Sargent Purchase, Alpine Garden, *Williams* (1896), *P.* 10542 (1907), Tuckerman Ravine, *Williams* (1897), Hermit Lake, *P.* 10645 (1907); Bean Purchase, West Royce Mtn., *P.* 18143 (1921).

ABIES [Tourn.] Hill. Fir.

Abies balsamea (L.) Mill. Balsam Fir. Abundant at lower levels in wet and dry, open and shaded localities, and becoming

the chief species in the scrub growth at high levels.—Pittsburg, near Third Lake, *P.* 10303 = *M.* 3500 (1907); (Stewartstown); (Colebrook); (Columbia); (Millsfield); (Errol); (Stratford); (Dummer); (Stark); (Milan); Success, *M.* 4113 (1908); (Berlin); (Lancaster); Whitefield, *Deane* (1895); (Jefferson); Randolph, *Williams* (1897), *M.* 1011, 1106 (1903), *P.* 11326 (1908); (Gorham); Shelburne, *C. E. Faxon* (no date), *Deane* (1917); Low & Burbank Grant, *M.* 3362 (1907); Thompson & Meserve Purchase, Mt. Madison, *M.* 1431 (1903), *P.* 10358 = *M.* 3344 (1907), *P.* 16501 (1917), Carriage Road, *J. R. Churchill* (1895), *Williams* (1898); Sargent Purchase, *M.* 4048 (1907), Tuckerman Ravine, *Williams* (1895), Lakes of the Clouds, *Williams* (1895); (Pinkham Grant); (Bean Purchase).

Abies balsamea (L.) Mill., var. **phanerolepis** Fern. (*Rhod.* 11 (1909), 203). Probably not rare.—Low & Burbank Grant, Valleyway, 4500 ft., *P.* 16733 (1917); Shelburne, Shelburne Moriah, 3750 ft., *Miss A. W. Christensen & Miss C. A. Gauthier* (1917), summit of Mt. Cabot, *Miss L. L. Howe* (1917).

TSUGA (Endl.) Carr. Hemlock.

Tsuga canadensis (L.) Carr. Rocky woods and banks of streams, frequent, but apparently not reaching the northern end of the County.—Colebrook, *P.* 10432 = *M.* 3816 (1907); Dummer, *F. & P.* 16549 (1917); Northumberland, *P.* 16469 (1917); (Milan); (Success); Dalton, *M.* 4365 (1908); Jefferson, *P.* 17505 (1919); Randolph, *M.* 1012 (1903), *P.* 11234 (1908); Gorham, *P.* 16105 (1914); Shelburne, *M.* 4323, 4324 (1908), *P.* 17822 (1920).

THUJA L. Arbor Vitae.

Thuja occidentalis L. Arbor Vitae; White Cedar. In calcareous regions common in cedar bogs and wet pastures; elsewhere occasional along river banks and shores of ponds (*cf.* Fernald in *Rhodora*, 21 (1919), 63–64).—Pittsburg, Third Lake, *P.* 10332 = *M.* 3479 (1907), First Lake, *M.* 3556 (1907); Clarksville, *M.* 3702 (1907); Stewartstown, *P.* 10210 = *M.* 3404 (1907); Colebrook, *Williams* (1895), *M.* 3203 (1906), *P.* 10435 = *M.* 3800 (1907); Columbia, *M.* 3844 (1907); Stratford, *P.* 13524 (1912); Northumberland, *P.* 12119 (1909); Stark, *P.* 12760 (1909); Milan, *P.* 10568 (1907), 13725 (1912), *Deane* (1916); Lancaster,

Deane (1896), *P.* 12193 (1909); Dalton, *P.* 11612 = *M.* 4361 (1908); Whitefield, *P.* 11569 = *M.* 4381 (1908); Jefferson, Mud Pond, *P.* 17342 (1918); Carroll, one tree by railroad near Crawford's, *P.* 16644 (1916); Millsfield, *P.* 18156 (1921); Errol, Pine Point, *P.* 10504 (1907); Cambridge, Lake Umbagog, *Williams* (1895), *P.* 16550 (1915), *Deane* (1917); Dummer, *P.* 16545 (1917); Success, *P.* 10672 (1907); Berlin, *P.* 5422 (1904), *M.* 4309 (1908); Gorham, *W. C. Cusick* (1887), *M.* 4053 (1907), *P.* 11690 (1908); Shelburne, *Deane* (1882, 1885, 1908), *P.* 11158 = *M.* 4149 (1908).

JUNIPERUS [Tourn.] L. JUNIPER.

Juniperus communis L., var. **depressa** Pursh. Old fields and exposed slopes, rather rare.—Randolph, *P.* 12375 (1909); Gorham, *P.* 16609 (1915), 18086 (1920); Shelburne, *A. E. Philbrook* (1908), *Deane* (1908, 1921, 1922); Martin Location, *P.* 19140 (1922); Hadley Grant, Hart Ledge, *P.* 16626 (1915).

TYPHACEAE (CAT-TAIL FAMILY).

TYPHA [Tourn.] L. CAT-TAIL.

Typha latifolia L. Swamps and railroad ditches, frequent.—Pittsburg, near Canaan line, *P.* 10419 = *M.* 3739 (1907); (Stewartstown); (Stratford); (Dummer); (Stark); (Northumberland); Whitefield, *M.* 5044 (1913); Jefferson, *P.* 17578 (1919); Randolph, *Williams* (1897), *M.* 1127 (1903), *P.* 9910 (1906), 17935 (1920) with two pistillate parts of the spike separated from each other and from the staminate; Gorham, *M.* 374 (1902), *P.* 16902 (1916); Shelburne, *Deane* (1922).

Typha latifolia L., var. **ambigua** Sonder. Rare.—Milan, *P.* 17860 (1920).

SPARGANIACEAE (BUR-REED FAMILY).

SPARGANIUM [Tourn.] L. BUR-REED.

Sparganium americanum Nutt. (including var. *androcladum* Fern. & Eames; *cf. Rhod.* 24 (1922), 33). Muddy shores, frequent.—Lancaster, Martin Meadow Pond, *P.* 17599 (1919); Dalton, *P.* 11607 (1908), *M.* 5011 (1913); Whitefield, Weed Pond, *P.* 14450 (1913); Jefferson, Cherry Pond, *P.* 11424 (1908).

Sparganium chlorocarpum Rydb. (*S. diversifolium* of *Manual*, not Graebn.; *cf. Rhod.* 24 (1922), 33). Muddy shores, frequent.—

Colebrook, *F. & P.* 16627 (1917); Stratford, *P.* 17711 (1919); Milan, *P.* 13852 (1912); Dalton, *M.* 4371 (1908); Carroll, Crawford's, *Miss S. Minns* (1888); Randolph, Upper Ammonoosuc River, *P.* 5376 (1904); Shelburne, *Deane* (1883).

Sparganium chlorocarpum Rydb., var. **acaule** (Beeby) Fern. (*S. diversifolium* of *Manual*, var. *acaule* (Beeby) Fernald & Eames; *cf. Rhod.* 24 (1922), 29). Similar localities, common.—Pittsburg, *P.* 17691 (1919); Northumberland, *P.* 17281 (1918); Milan, *P.* 13853 (1912); Success, *P.* 10673 (1907); Lancaster, *P.* 12374 (1909); Dalton, *M.* 4439 (1908); Whitefield, *P.* 11561 = *M.* 4422 (1908); Carroll, *Williams* (1895); Randolph, *J. R. Churchill* (1889), *Williams* (1893), *P.* 10610, 10747 (1907); Shelburne, *Deane* (1918); Pinkham Grant, Dismal Pool, *P.* 13889 (1912).

Sparganium angustifolium Michx. Shallow ponds and streams, frequent.—Pittsburg, Round Pond, *W. C. Kendall, E. L. Goldsborough, & A. Doolittle* (1904); Stewartstown, Ladd Pond, *F. & P.* 17002 (1917); Columbia, Lime Pond, *P.* 13884 (1912); Dalton, Forest Lake, *P.* 11582 (1908); Whitefield, Burns Pond, *M.* 5027, 5043 (1913); Carroll, near Gate of the Notch, *C. E. Faxon* (1878); Jefferson, Cherry Pond, *P.* 11443 (1908); Sargent Purchase, Hermit Lake, *C. G. Pringle* (1877, 1878), *P.* 10735 (1907).

Sparganium fluctuans (Morong) Robinson. Cool shallow lakes, frequent.—Pittsburg, inlet of First Lake, *W. C. Kendall, E. L. Goldsborough, & A. Doolittle* (1904); Whitefield, Burns Pond, *P.* 14579 (1913); Jefferson, Cherry Pond, *P.* 10628 (1907); Bean Purchase, Carter Lake, *P.* 12905 (1910), *M.* 5079 (1913).

NAJADACEAE (PONDWEED FAMILY).

POTAMOGETON [Tourn.] L. Pondweed.

Potamogeton natans L. Stewartstown, *F. & P.* 17047 (1917); Carroll, near Fabyans, *E. & C. E. Faxon* (1879).

Potamogeton Oakesianus Robbins. Northumberland, Connecticut River, *P.* 12171 (1909); Shelburne, Wheeler's bog, *Deane* (1884).

Potamogeton epihydrus Raf. Ponds and slow streams, common.—Pittsburg, Mud Pond, *W. C. Kendall, E. L. Goldsborough, & A. Doolittle* (1904), First Lake, *W. C. Kendall, E. L. Golds-*

borough, & A. Doolittle (1904); Berlin, outlet of Head Pond, *P.* 17828 (1920), 19066 (1922); Dalton, *M.* 4446 (1908); Whitefield, Weeks Pond, *P.* 14418 (1913); Jefferson, Little Cherry Pond, *P.* 12928 (1910), Cherry Pond, *P.* 10666 (1907), 14455 (1913); Randolph, Pond of Safety, *M.* 1139 (1903), *P.* 4698, 4699 (1904), 9981 (1906); Gorham, Mascot Pond, *Deane* (1884); Shelburne, creek, *Deane* (1914).

Potamogeton alpinus Balbis. Infrequent.—Colebrook, *F. & P.* 17024 (1917); Northumberland, Horseshoe Pond, *P.* 17270 (1918).

Potamogeton amplifolius Tuckerm. Ponds, more common northward.—Pittsburg, Mud Pond, *W. C. Kendall, E. L. Goldsborough, & A. Doolittle* (1904); Stewartstown, *F. & P.* 16958 (1917); Columbia, Lime Pond, *P.* 13883 (1912); Whitefield, Burns Pond, *P.* 14585 = *M.* 5036 (1913); Kilkenny, York Pond, *P.* 17185 (1918).

Potamogeton gramineus L., var. **graminifolius** Fries (*P. heterophyllus* Schreb., f. *graminifolius* (Fries) Morong; *cf. Rhod.* 23 (1921), 189–190). Ponds and slow streams, frequent and variable.—Stewartstown, Ladd Pond, *F. & P.* 16957, 17056 (1917); Errol, *F. & P.* 17057 (1917); Milan, North Branch of Upper Ammonoosuc River, *P.* 13821 (1912); Shelburne, Androscoggin River, *Deane* (1885); Whitefield, Burns Pond, *P.* 14582 = *M.* 5022, *P.* 14583 = *M.* 5052 (1913).

Potamogeton praelongus Wulf. Local.—Pittsburg, Round Pond, *W. C. Kendall, E. L. Goldsborough, & A. Doolittle* (1904); Stewartstown, Ladd Pond, *P.* 14012 (1912).

Potamogeton bupleuroides Fern. Slow streams and shallow lakes.—Pittsburg, Second Lake, *W. C. Kendall, E. L. Goldsborough, & A. Doolittle* (1904); Stewartstown, *F. & P.* 16943 (1917); Northumberland, Connecticut River, *P.* 12143 (1909); Dalton, Connecticut River, *P.* 16591 (1917).

Potamogeton obtusifolius Mert. & Koch. Local.—Columbia, Lime Pond, *P.* 13998 (1912), *F. & P.* 16717 (1917).

Potamogeton pusillus L., var. **tenuissimus** Mert. & Koch. Ponds and slow streams, common.—Pittsburg, First Lake, *W. C. Kendall, E. L. Goldsborough, & A. Doolittle* (1904); Stewartstown,

Ladd Pond, *F. & P.* 17034 (1917); Berlin, York Pond, *P.* 17186 (1918), Dead River, *P.* 14478 (1913); Dalton, Forest Lake, *P.* 11578 (1908), 11792½ (1908); Randolph, Pond of Safety, *P.* 4011, 4013 (1904), 9980 (1906).

Potamogeton Vaseyi Robbins. Local.—Stewartstown, *F. & P.* 17038 (1917).

Potamogeton lacunatus Hagström. Ponds, local.—Berlin, Dead River, *P.* 4702 (1904); Jefferson, Cherry Pond, *P.* 16823 (1916).

Potamogeton foliosus Raf. Infrequent.—Dalton, *P.* 12293 (1909).

Potamogeton confervoides Reichenb. Local.—Jefferson, Little Cherry Pond, *P.* 12929 (1910); Shelburne, Dream Lake, *P.* 19220 (1923).

Potamogeton dimorphus Raf. Ponds and slow streams, common in the Connecticut valley.—Pittsburg, First Lake, *W. C. Kendall, E. L. Goldsborough, & A. Doolittle* (1904); Stewartstown, *F. & P.* 17046 (1917); Stratford, Connecticut River, near North Stratford, *W. Boott* (1855); Northumberland, *P.* 12169 (1909), Horseshoe Pond, *P.* 17275 (1918); Dalton, *P.* 11792 (1908).

Potamogeton Robbinsii Oakes.—Pittsburg, First Lake, *W. C. Kendall, E. L. Goldsborough, & A. Doolittle* (1904); Stewartstown, *F. & P.* 16942 (1917); Dalton, Forest Lake, *P.* 11580 = *M.* 4445 (1908); (Jefferson, Cherry Pond, *J. W. Robbins* (1829); *cf.* Oakes in *Hovey's Mag.* 7 (1841), 180: the publication of the species, which has apparently not since been collected at this its type station).

NAJAS L. Naiad.

Najas flexilis (Willd.) Rostk. & Schmidt. Shallow ponds and streams, occasional.—Stewartstown, *F. & P.* 17039 (1917), Ladd Pond, *F. & P.* 17035 (1917); Columbia, *P.* 13965 (1912), Lime Pond, *P.* 13885 (1912); Northumberland, Horseshoe Pond, *P.* 17174 (1918); Dalton, Forest Lake, *P.* 11577 = *M.* 4447, 4449 (1908); Whitefield, Burns Pond, *P.* 14584 = *M.* 5053 (1913).

JUNCAGINACEAE (ARROW GRASS FAMILY).

SCHEUCHZERIA L.

Scheuchzeria palustris L., var. **americana** Fern. (*Rhod.* 25 (1923), 177–179). Cold peat bogs, local.—Stewartstown, Buck Pond, *F. & P.* 16606 (1917); Berlin, Head Pond, *P.* 14503 (1913); Jefferson, Cherry Pond, *P.* 11433 (1908), Little Cherry Pond, *P.* 12927 (1910); Shelburne, Wheeler's bog, *Deane* (1884).

ALISMACEAE (WATER-PLANTAIN FAMILY).

SAGITTARIA L. Arrow-head.

Sagittaria latifolia Willd. Muddy shores, less common than the varieties.—Stewartstown, *F. & P.* 17010, 17066 (1917); Whitefield, Weed Pond, *P.* 14446 (1913).

Sagittaria latifolia Willd., f. **diversifolia** (Engelm.) Robinson. Frequent.—Whitefield, Weed Pond, *P.* 14463 (1913); Jefferson, Cherry Pond, *P.* 10744 (1907), Little Cherry Pond, *P.* 12924 (1910).

Sagittaria latifolia Willd., f. **gracilis** (Pursh) Robinson. Muddy shores, common.—Cambridge, Lake Umbagog, *P.* 18208 (1921); Lancaster, *P.* 12373 (1909); Jefferson, *M.* 137 (1902); Gorham, *M.* 4279 (1908); Shelburne, *Deane* (1883, 1884, 1914).

Sagittaria latifolia Willd., f. **hastata** (Pursh) Robinson. Frequent.—Stewartstown, Ladd Pond, *P.* 10889 (1907); Dalton, *P.* 11500 = *M.* 4379 (1908); Milan, Nay's Pond, *P.* 13830 (1912); Gorham, *P.* 10706, 10796 (1907); Shelburne, *Deane* (1915).

Sagittaria latifolia Willd., f. **obtusa** (Muhl.) Robinson. Occasional.—Lancaster, Coös Junction, *P.* 12125 (1909); Whitefield, Burns Pond *P.* 17793 (1919).

Sagittaria cuneata Sheldon (*S. arifolia* Nutt.; *cf. Rhod.* 23 (1921), 192). Shallow water and muddy shores, frequent.—Stewartstown, Ladd Pond, *M.* 3959 (1907); Columbia, *M.* 3858 (1907); Cambridge, Lake Umbagog, *Williams* (1906); Dalton, *P.* 12322 (1909); Jefferson, Cherry Pond, *P.* 10629, 10655 (1907); Randolph, Pond of Safety, *P.* 5703, 5704 (1904).

Sagittaria graminea Michx. Muddy shores, occasional.—Pittsburg, Second Lake, *W. C. Kendall, E. L. Goldsborough, & A. Doolittle* (1904), First Lake, *W. C. Kendall, E. L. Goldsbor-*

ough, & A. Doolittle (1904); Stewartstown, *F. & P.* 16956 (1917); Whitefield, Burns Pond, *P.* 17795 (1919); Berlin, Head Pond, *P.* 19083 (1922); Gorham, Mascot Pond, *Williams* (1895), *P.* 11701 (1908); Shelburne, *Deane* (1884, 1914).

ALISMA. L. Water-plantain.

Alisma Plantago-aquatica L. Muddy shores, local.—Stratford, *P.* 17661 (1919); Dalton, *M.* 4382 (1908); Gorham, *M.* 4064 (1907), *P.* 10812 (1907), *M.* 4277 (1908), *F. & P.* 16860 (1917).

GRAMINEAE (GRASS FAMILY).

ZEA L. Indian Corn; Maize.

Zea Mays L. Occasionally spontaneous on dumps and railroad tracks.—(Colebrook); Whitefield, *M.* 4341 (1908); Jefferson, *P.* 10779 (1907); Shelburne, *Deane* (1920).

ANDROPOGON [Royen] L. Beard Grass.

Andropogon scoparius Michx., var. **frequens** Hubbard (*Rhod.* 19 (1917), 103). Chiefly introduced along railroad tracks, except in Shelburne; scarce.—Northumberland, by railroad, *P.* 19093 (1922); Lancaster, abundant by railroad, *P.* 12275 (1909); Dalton, near Scott Junction, *P.* 12292 (1909), 16315 (1914); Randolph, one plant by railroad, *P.* 17605 (1919); Gorham, one clump by railroad, *P.* 16794 (1916); Shelburne, island, Philbrook Farm, *Deane* (1914).

Andropogon furcatus Muhl. Rare.—Northumberland, by railroad, *P.* 19090 (1922); Shelburne, large area on Evans Island near Philbrook Farm, *Deane* (1921, 1922).

DIGITARIA Scop. (*Syntherisma* Walt.). Finger Grass.

Digitaria Ischaemum Schreb. *ex* Muhl. (*D. humifusa* Pers.; *cf. Rhod.* 18 (1916), 231–232). Waste ground, occasional.—Jefferson, Jefferson Junction, *P.* 16820 (1916); Randolph, *P.* 1600 (1902), *P.* 5741 = *M.* 1936 (1904); Shelburne, *Deane* (1916).

Digitaria sanguinalis (L.) Scop. Waste ground, scarce.—Shelburne, *Deane* (1915).

PANICUM L. Panic Grass.

Panicum capillare L. Waste ground, scarce.—Gorham, *P.* 17394 (1919).

Panicum capillare L., var. occidentale Rydb. (*Rhod.* 21 (1919), 111). Waste ground, frequent.—Stark, *P.* 16308 (1914); Berlin, *P.* 18219 (1921); Jefferson, *P.* 16873 (1916); Randolph, *J. R. Churchill* (1889), *P.* 5742 = *M.* 1935 (1904); Shelburne, *Deane* (1917, 1918).

Panicum Tuckermani Fern. (*Panicum philadelphicum* Berh. in part; *cf. Rhod.* 21 (1919), 112). Railroad tracks, ditches, and wet shores, not rare.—Errol, *F. & P.* 16968 (1917); Randolph, *P.* 4127 (1904), 17608 (1919); Gorham, *P.* 17327 (1918); Shelburne, *Deane* (1915, 1916).

Panicum miliaceum L. Occasionally adventive.—Berlin, *P.* 11522 = *M.* 4492 (1908), *P.* 14498 (1913); Randolph, grain-field, *P.* 16311 (1914).

Panicum depauperatum Muhl. (*cf. Rhod.* 23 (1921), 194). Gravelly soil, rather infrequent.—Whitefield, *P.* 16065 (1914); Carroll, Quebec Junction, *P.* 12691 (1910); Gorham, railroad track south of Cascade village, *P.* 17849 (1920); Shelburne, *Deane* (1915); Hadley Grant, Mt. Hope, *P.* 16460 (1915).

Panicum linearifolium Scribn., var. **Werneri** (Scribn.) Fern. (*P. Werneri* Scribn.; *cf. Rhod.* 23 (1921), 194). Dry banks, infrequent.—Randolph, *P.* 16484 (1915); Shelburne, *Deane* (1915, 1916).

Panicum boreale Nash. Woods and banks, very common.—Pittsburg, west of Indian Stream, *P.* 10690, 10978 = *M.* 3757 (1907); Dartmouth College Grant, *P.* 12640 (1910); Errol, *F. & P.* 17053 (1917); Stewartstown, *P.* 10970, 10146 = *M.* 3690 (1907); Columbia, *P.* 13976 (1912); Stratford, *F. & P.* 16896 (1917); Milan, *P.* 13718, 13768 (1912); (Success); Dalton, *P.* 17588 (1919); Whitefield, *Deane* (1896), *H. St. John* (1912); Jefferson, *P.* 16487 (1917); Randolph, *Williams* (1897), *P.* 195 (1901), 1566 (1902), 3160 (1903), *M.* 1053 (1903), *P.* 4183 (1904), 10690, 10764 (1907), 16073 (1914); (Gorham); Shelburne, *Deane* (1884, 1911, 1913, 1914); Carroll, *P.* 14370, 14387 (1913); Sargent Purchase, *F. & P.* 16896 (1917); Martin Location, *P.* 14334 (1913).

Panicum Lindheimeri Nash. Infrequent and perhaps local.—Shelburne, *Deane* (1913).

Panicum Lindheimeri Nash, var. **fasciculatum** (Torr.) Fern. (*P. huachucae* Ashe, *P. tennesseense* Ashe; *cf. Rhod.* 23 (1921), 228). Open soil, common.—Stewartstown, Ladd Pond, *F. & P.* 16838 (1917); Columbia, Fish Pond, *P.* 16835 (1917); Berlin, *P.* 17143 (1918), 17475 (1919); Gorham, *P.* 12669 (1910); Shelburne, *Deane* (1909); Martin Location, *P.* 14270 (1913); Carroll, Quebec Junction, *P.* 12690 (1910).

Panicum Lindheimeri Nash, var. **implicatum** (Scribn.) Fern. (*Rhod.* 23 (1921), 228). Dry ground, common.—Dartmouth College Grant, *P.* 16143 (1914); Jefferson, *F. & P.* 16898 (1917); Randolph, *Williams* (1894), *P.* 190 (1901), 1567, 1760 (1902), 4173 (1904), 10763 (1907); Shelburne, *Deane* (1911, 1913, 1914, 1915, 1917, 1921).

Panicum Lindheimeri Nash, var. **septentrionale** Fern. (*Rhod.* 23 (1921), 227). Dry soil, frequent.—Dartmouth College Grant, *P.* 16143a (1914); Stewartstown, *F. & P.* 16826 (1917); Stratford, *F. & P.* 16810, 16899 (1917); Northumberland, *F. & P.* 16811 (1917); Shelburne, *Deane* (1911, 1913, 1914, 1915, 1916, 1917).

Panicum subvillosum Ashe. Local.—Shelburne, *Deane* (1911, 1917, 1921, 1922).

Panicum macrocarpon Torr. (*P. Scribnerianum* Ashe; *cf. Rhod.* 14 (1912), 184). Rare.—Lancaster, *P.* 12274 (1909); Jefferson, *P.* 14392 (1913); Cherry Mtn. station, on railroad track, *P.* 17355 (1918).

Panicum xanthophysum Gray. Sandy soil, local.—Whitefield, *P.* 14215 (1913), 16673 (1916); Dalton, west of Forest Lake, *P.* 19046 (1922); Jefferson, near Little Cherry Pond, *P.* 12920 (1910); Shelburne, *Deane* (1883, 1884), *P.* 11169 = *M.* 4107 (1908), *Deane* (1914).

Panicum clandestinum L. Alluvial soil, infrequent.—Stratford, *F. & P.* 16644 (1917), *P.* 17666 (1919); Gorham, *P.* 14244 (1913), 17616 (1919); Shelburne, *Deane* (1884), *P.* 17739 (1919).

ECHINOCHLOA Beauv.

Echinochloa crusgalli (L.) Beauv. Barnyard Grass. Waste ground.—Randolph, *P.* 4125 (1904), 19094 (1922); Martin Location, *P.* 12846 (1910); Shelburne, *Deane* (1916).

Echinochloa muricata (Michx.) Fern., var. occidentalis Wieg. (*Rhod.* 23 (1921), 58). Waste ground, occasional.—Jefferson, *P.* 16870 (1916); Randolph, *P.* 11684 (1908); Shelburne, *Deane* (1919).

Echinochloa frumentacea (Roxb.) Link. Japanese Barnyard Millet; Billion-dollar Grass. Occasionally and only very recently escaped from cultivatino.—Stratford, alluvial thicket, *P.* 17681 (1919); Shelburne, *Deane* (1916); also an albino form, Shelburne, *Deane* (1919).

SETARIA Beauv. Bristly Foxtail Grass.

Setaria lutescens (Weigel) Hubbard (*S. glauca* (L.) Beauv.; *cf. Rhod.* 18 (1916), 232). Cultivated ground, rare.—Gorham, *P.* 16603 (1915), 16917 (1916).

Setaria viridis (L.) Beauv. Cultivated grounds, frequent.—Lancaster, *P.* 12353 (1909); Whitefield, *Deane* (1896), *P.* 11556 = *M.* 4414 (1908); Randolph, *Williams* (1897), *P.* 6417 = *M.* 1933 (1904), *P.* 11469 (1908); Shelburne, *Deane* (1883, 1885).

Setaria italica (L.) Beauv. Hungarian Grass. Occasionally escaped from cultivation.—Shelburne, *Deane* (1883).

Setaria italica (L.) Beauv., var. Metzgeri (Körnicke) Hubbard (*Rhod.* 18 (1916), 233). Escaped from cultivation.—Gorham, *P.* 10813 (1907).

LEERSIA Sw. Cut-grass.

Leersia oryzoides (L.) Sw. Rice Cut-grass. Wet ditches and pond borders, frequent.—(Pittsburg); Stewartstown, *F. & P.* 16936 (1917); Stratford, *P.* 17657 (1919); Berlin, *P.* 17643 (1919); Lancaster, Martin Meadow Pond, *P.* 17586 (1919); Dalton, *P.* 11605 = *M.* 4378 (1908); Jefferson, *P.* 10786 (1907); Randolph, *P.* 4055 (1904); Gorham, *P.* 10723 (1907); Shelburne, *Deane* (1884).

PHALARIS L. Canary Grass.

Phalaris canariensis L. Ballast, rare.—Gorham, *P.* 19272 (1923).

Phalaris arundinacea L. Moist meadows, chiefly in the Connecticut valley.—Stewartstown, Ladd Pond, *P.* 14018 (1912);

Colebrook, *F. & P.* 16692 (1917); Columbia, Lime Pond, *P.* 10447 = *M.* 3854 (1907); Northumberland, *P.* 16309 (1914); Lancaster, *P.* 12294, 12381 (1909), 16066 (1914); Dartmouth College Grant, Magalloway River, *P.* 16198 (1914); Berlin, *P.* 16265 (1914).

Phalaris arundinacea L., f. picta (L.) Aschers & Graebn. (*cf. Rhod.* 24 (1922), 185). Ribbon Grass; Striped Grass. Frequently escaped from cultivation.—Stratford, persistent near site of house, *P.* 13507 (1912); Stark, *P.* 17489 (1919); Jefferson, *P.* 10784 (1907); Gorham, *P.* 17372 (1919); Shelburne, *Mrs. J. L. Moore* (1919).

ANTHOXANTHUM L. Sweet Vernal Grass.

Anthoxanthum odoratum L. Meadows and roadsides, common.—Pittsburg, near Third Lake, *P.* 10337 = *M.* 3513 (1907); Lancaster, *P.* 16379 (1915); Whitefield, *P.* 14234 (1913); Randolph, *P.* 11239 (1908); Berlin, *P.* 17116 (1918); Gorham, *P.* 16482, 16648 (1917).

Anthoxanthum Puelii Lecoq & Lamotte.—Adventive in gravelly soil, rare.—Randolph, *P.* 16560 (1917), 17375 (1919); Berlin, near Russian church, *P.* 16485 (1917).

HIEROCHLOË [Gmel.] R. Br. Holy Grass.

Hierochloë odorata (L.) Wahl. (not var. *Fragrans.* (Willd.) Richt. as stated in *Rhod.* 19 (1917), 152). Alpine meadows, frequent; in lowland meadows local and often appearing to be adventive.—Dix Grant Diamond Farm, *P.* 16138 (1914); Stratford, *P.* 13502 (1912); Stark, *P.* 14124 (1913); Success, old logging railroad, *P.* 14128 (1913); Jefferson, *P.* 16365 (1915); Randolph, *P.* 11260 (1908); Shelburne, *Deane* (1903); Thompson & Meserve Purchase, Edmands Col, *P.* 184 (1901); Sargent Purchase, Mt. Washington, *W. F. Flint & J. H. Huntington* (1876); Tuckerman Ravine, *H. Mann* (1862), *E. & C. E. Faxon* (1887), *J. R. Churchill, Williams* (1895), *M.* 303 (1902), *Miss S. Minns* (no date), Lakes of the Clouds, *W. G. Farlow* (1882). Alpine regions, not definitely located, *Oakes* (no date), *Tuckerman* (1840).

Hierochloë alpina (Sw.) R. & S. Alpine meadows and heads of ravines, frequent.—Low & Burbank Grant, Spur Trail, *P.* 16481 (1915); Thompson & Meserve Purchase, Madison Spring col, *P.*

183 (1901), Mt. Adams, *M.* 3355 (1907), Peabody Spring, *P.* 10883 (1907), Mt. Clay, *P.* 11232 (1908); Sargent Purchase, Mt. Washington, *C. E. Faxon* (1878), *E. & C. E. Faxon* (1886), Alpine Garden, *E. & C. E. Faxon* (1887), *J. R. Churchill* (1895), *P.* 10590 (1907), Huntington Ravine, *J. A. Allen* (1878), *F. & P.* 16866 (1917), Tuckerman Ravine, *Williams* (1895); Cutts Grant, Crawford Path, *E. & C. E. Faxon* (1895), Head of Oakes Gulf, *P.* 11228 (1908).

MILIUM [Tourn.] L. Millet Grass.

Milium effusum L. Rich woods, not infrequent, especially northward.—Pittsburg, near Third Lake, *P.* 10298 = *M.* 3497 (1907), near Camel's Rump, *P.* 19108 (1922), near Second Lake, *P.* 10188 = *M.* 3522 (1907); Dartmouth College Grant, *P.* 12603 (1910); Dix Grant, *P.* 16133 (1914); Dixville, *P.* 10625 (1907); Stewartstown, *P.* 12630 (1910), *F. & P.* 16680 (1917); Colebrook, *P.* 10384 = *M.* 3950 (1907); Errol, *P.* 12644 (1910); Stark, *P.* 17445 (1919); Milan, *P.* 17117 (1918); Kilkenny, Mt. Pliny, *P.* 11096 (1907); (Lancaster); Dalton, Dalton Mt., *P.* 16054 (1914); Low & Burbank Grant, Ravine of the Castles, *P.* 16694 (1916).

ORYZOPSIS Michx. Mountain Rice.

Oryzopsis asperifolia Michx. Hillside woods, sandy alluvial soil, etc., frequent.—(Clarksville); Dartmouth College Grant, *P.* 12626 (1910); Columbia, *P.* 10450 = *M.* 3846 (1907); Northumberland, *P.* 13560 (1912); (Stark); (Milan); Berlin, *P.* 16113 (1914), 16483 (1917); (Lancaster); (Dalton); Whitefield, *P.* 16668 (1916); Randolph, *P.* 12060 (1909); Gorham, *P.* 10941 (1907); Shelburne, *Deane* (1904, 1909), *P.* 11171 = *M.* 4108 (1908); Martin Location, *P.* 13664 (1912); Bean Purchase, Wild River valley, *P.* 16018 (1914).

Oryzopsis racemosa (Sm.) Ricker. Rocky woods, very local.—Shelburne, *Deane* (1884, 1917).

MUHLENBERGIA Schreb.

Muhlenbergia sylvatica Torr. Moist banks, not common.—Colebrook, *F. & P.* 16966 (1917); Jefferson, *P.* 17239 (1918); Shelburne, *Deane* (1914).

Muhlenbergia foliosa Trin. Moist banks and swampy ground, common.—Stewartstown, *F. & P.* 17041 (1917); (Colebrook); (Columbia); Errol, *P.* 16280 (1914); Cambridge, *F. & P.* 16971 (1917); Stratford, *P.* 17669 (1919); Milan, *P.* 17311 (1918); Lancaster, *P.* 14537 (1913), 17629 (1919); Dalton, *P.* 11591 = *M.* 4387 (1908); Jefferson, *P.* 1724 (1902); Randolph, *P.* 1755 (1902), 2505 (1903), 4052, 4053 (1904), 17226 (1918), 17649 (1919); Gorham, *P.* 11476 (1908), 16501, 16541 (1915), 16943 (1916); Shelburne, *Deane* (1885, 1914, 1915).

Muhlenbergia mexicana (L.) Trin. Local.—Stewartstown, *F. & P.* 17040 (1917); Columbia, *P.* 17717 (1919).

Muhlenbergia racemosa (Michx.) BSP. Ledges and sandy banks, occasional.—Dartmouth College Grant, Gorge of the Diamond, *P.* 10502 (1907); Cambridge, Lake Umbagog, *P.* 16552 (1915); (Stark); (Northumberland); Milan, *P.* 13789 (1912); Berlin, *P.* 16108 (1914); Randolph, *P.* 18165 (1921); Gorham, *P.* 12518 (1909); Shelburne, *Deane* (1917); Bean Grant, Mt. Webster, *P.* 11724 (1908); Hadley Grant, Mt. Crawford, *P.* 11711 (1908).

DILEPYRUM Michx.

Dilepyrum erectum (Schreb.) Farwell (*Brachyelytrum erectum* (Schreb.) Beauv.; *cf. Am. Midl. Nat.* 8 (1922), 33). Damp woods and roadsides, common.—Dartmouth College Grant, *P.* 14269 (1914); (Stewartstown); Colebrook, *P.* 10394 = *M.* 3949 (1907); (Columbia); (Stark); Northumberland, *P.* 12117 (1909); Milan, *P.* 13792 (1912); (Success); (Berlin); Lancaster, *P.* 17622 (1919); (Dalton); (Jefferson); Randolph, *Williams* (1894); *P.* 160 (1901), 10856 (1907), *M.* 4197 (1908); Gorham, *Deane* (1884); Shelburne, *Deane* (1914); (Carroll); (Low & Burbank Grant); (Pinkham Grant); (Bean Purchase).

PHLEUM L.

Phleum pratense L. Timothy. Meadows and roadsides, very common.—Pittsburg, First Lake, *M.* 3658 (1907); (Stewartstown); Colebrook, *P.* 10909 = *M.* 4014 (1907); (Columbia); (Millsfield); (Stratford); (Stark); (Northumberland); (Milan); (Success); (Berlin); (Kilkenny); (Lancaster); (Dalton); (Jefferson); Randolph, *Williams* (1897), *M.* 233 (1902), *P.* 11221 (1908);

(Gorham); Shelburne, *Deane* (1883, 1909, 1916); (Carroll); (Low & Burbank Grant); Thompson & Meserve Purchase, Carriage Road, *Williams* (1897); Sargent Purchase, summit of Mt. Washington, *Williams* (1901); (Bean Purchase). A proliferous form has been collected as follows: Errol, *F. & P.* 17072 (1917); Randolph, *P.* 12243 (1909); Shelburne, *Deane* (1916).

Phleum alpinum L. Alpine meadows and heads of ravines, local.—Thompson & Meserve Purchase, head of the Great Gulf, *Williams* (1895), *P.* 12882 (1910); Sargent Purchase, Mt. Washington, *W. F. Flint & J. H. Huntington* (1876), *E. & C. E. Faxon* (1877), *J. A. Allen* (1878), Alpine Garden, *P.* 10548 (1907), Huntington Ravine, *C. E. Faxon* (1887), *F. & P.* 16877 (1917), Tuckerman Ravine, *J. R. Churchill* (1889, 1890, 1895), *E. & C. E. Faxon* (1890), *Williams* (1895), *M.* 01 (1901), *P.* 1534 (1902), *M.* 1085 (1903); Cutts Grant, Oakes Gulf, *Williams* (1893), *P.* 12036 = *M.* 4541 (1909). Alpine regions, not definitely located: *Oakes* (no date), *Tuckerman* (no date), *H. Mann* (1862).

ALOPECURUS L. Foxtail.

Alopecurus pratensis L. Meadow Foxtail. Meadows, rare.—Shelburne, Philbrook intervale, introduced since 1915, but abundant in two places, *Deane* (1916).

Alopecurus aristulatus Michx. (*A. geniculatus* L., var. *aristulatus* Torr.; *cf. Rhod.* 19 (1917), 165). Wet meadows and ditches, frequent.—Pittsburg, First Lake, *M.* 3582 (1907); Colebrook, *P.* 10913 = *M.* 3992 (1907), *P.* 13942 (1912); Dartmouth College Grant, *P.* 16259 (1914); Lancaster, *P.* 12270 (1909); Dalton, Scott Junction, *P.* 12366 (1909); Carroll, near Twin Mtn., *P.* 16651 (1916); Jefferson, near Bailey's, *P.* 14188 (1913); Shelburne, *Deane* (1915).

SPOROBOLUS R. Br. Drop-seed.

Sporobolus vaginiflorus (Torr.) Wood. Dry soil, rare.—Shelburne, *Deane* (1913).

Sporobolus uniflorus (Muhl.) Scribn. & Merr. Wet sandy soil and bogs, frequent.—Cambridge, Lake Umbagog, *P.* 16555 (1915); Stark, *P.* 12727 (1910); Berlin, Dead River, *P.* 17474 (1919); Randolph, Pond of Safety, *P.* 1762 (1902), 12684 (1910);

Carroll, Crawford's, *Williams* (1895), Saco Lake, *P.* 11714 (1908); Shelburne, near Gates Cottage, *P.* 17740 (1919).

AGROSTIS L. Bent Grass.

Agrostis alba L. Meadows and roadsides, common.—Clarksville, *F. & P.* 17048 (1917); (Millsfield); Errol, *Williams* (1895); (Stratford); Milan, *P.* 13818 (1912); (Success); (Berlin); (Lancaster); (Dalton); Whitefield, *Deane* (1897); (Jefferson); Randolph, *Williams* (1897); Gorham, *M.* 4059 (1907); Shelburne, *Deane* (1917); (Carroll); (Low & Burbank Grant); (Pinkham Grant). A viviparous form (*A. sylvatica* L.) occurs: Lancaster, *J. Barratt* (1824); Crawford Purchase, near Jefferson Brook, *P.* 12202 (1909); Thompson & Meserve Purchase, Base Station, *C. E. Faxon* (1878); Randolph, *Williams* (1897); Gorham, *W. N. Suksdorf* (1887).

Agrostis alba L., var. vulgaris (With.) Thurb. Red Top. Drier parts of meadows and roadsides, common.—Pittsburg, near Canaan line, *P.* 10977 = *M.* 3755 (1907); Dartmouth College Grant, *P.* 16179 (1914); Dixville Notch, *Deane* (1917); (Colebrook); (Columbia); (Milan); (Jefferson); Randolph, *J. R. Churchill* (1889), *Williams* (1896), *M.* 3370 (1907), *P.* 12012 (1909); Gorham, *P.* 12207 (1909); Shelburne, *Deane* (1883, 1909); (Carroll); (Low & Burbank Grant); Thompson & Meserve Purchase, near Jacob's Ladder, *C. E. Faxon* (1885); Bean Grant, Mt. Clinton, *M.* 02 (1901); Martin Location, *P.* 14261 (1913); Green Grant, *W. Boott* (1855); (Bean Purchase).

Agrostis alba L., var. **maritima** (Lam.) G. F. W. Mey. Low meadows and roadside ditches, occasional.—(Jefferson); Randolph, *P.* 17188 (1918).

Agrostis hyemalis (Walt.) BSP. Hair Grass. Dry or low sandy soil, common.—(Clarksville); Dartmouth College Grant, *P.* 16167 (1914); Dixville Notch, *Deane* (1917); (Columbia); (Millsfield); Cambridge, *P.* 16551 (1915); Milan, *P.* 13788 (1912), 17310 (1918); (Success); Berlin, Mt. Forist, *P.* 16121 (1914), Dead River, *P.* 17863 (1920); (Lancaster); (Jefferson); Randolph, *Williams* (1896), *P.* 11519 (1908), *M.* 4528 (1909), *P.* 16913 (1917); (Gorham); Shelburne, *Deane* (1914), Mt. Cabot, *Deane* (1915); Carroll, Crawford's, *A. S. Hitchcock* (1902); (Low &

Burbank Grant); (Thompson & Meserve Purchase); Hadley Grant, Mt. Crawford, *P.* 11694 (1908), Mt. Hope, *P.* 16446 (1915); Martin Location, *P.* 14264 (1913); Bean Purchase, *M.* 5063 (1913).

Agrostis perennans (Walt.) Tuckerm. Thin Grass. Damp shaded ground, common.—Colebrook, *P.* 10362 = *M.* 3989 (1907); (Millsfield); Cambridge, *P.* 18203 (1921); (Stark); Milan, *P.* 13822 (1912); (Success); Randolph, *J. R. Churchill* (1889), *P.* 2504 (1903), 5745 (1904); Shelburne, *P.* 11653, 11758 = *M.* 4322 (1908), *Deane* (1917); (Low & Burbank Grant); (Thompson & Meserve Purchase); Bean Grant, Mt. Clinton, *P.* 12358 (1909); Martin Location, *P.* 14262 (1913).

Agrostis borealis Hartm. Open, especially gravelly, situations above tree-line on the Presidential Range, occasionally descending along brooks and appearing at lower levels at Dixville Notch and the Diamond Gorge.—Dartmouth College Grant, Gorge of the Diamond River, *P.* 16283 (1914); Dixville Notch, *Deane* (1917); Low & Burbank Grant, Salamcis Fall, *P.* 16483 (1915); Bruin Rock, *P.* 12089 (1909), King Ravine, *A. P. Chadbourne* (1884), Knife Edge, *P.* 12099 (1909); Thompson & Meserve Purchase, Mt. Madison, *A. P. Chadbourne* (1884), *P.* 1576, 1663 (1901), Great Gulf, *E. & C. E. Faxon* (1882), *Williams* (1895), *E. & C. E. Faxon* (1895, 1896, 1897), Mike's House, *Williams* (1895), Carriage Road, *Deane* (1884), Cape Horn, *E. & C. E. Faxon & J. R. Churchill* (1895), *Williams* (1896, 1897); Sargent Purchase, Mt. Washington, *E. Faxon* (1877), *E. & C. E. Faxon* (1879, 1885, 1887, 1895), Alpine Garden, *E. & C. E. Faxon* (1881, 1882, 1885), *Williams* (1896), *P.* 10604 (1907), Tuckerman Ravine, *E. Faxon* (1885), *E. & C. E. Faxon* (1895), *W. W. Eggleston* (1898, 1901), *Miss S. Minns* (no date), Boott Spur, *Williams* (1893), near Lakes of the Clouds, *J. R. Churchill* (1890), *E. & C. E. Faxon* (1896), *Williams* (1896); Cutts Grant, Mt. Monroe, *W. Boott* (no date); *E. & C. E. Faxon* (1882), Stony Plain at foot of Mt. Monroe, *E. & C. E. Faxon* (1882), Oakes Gulf, *E. & C. E. Faxon* (1882); Bean Grant, Mt. Clinton, *Williams* (1895); collections from the alpine area not closely determinable: *W. Oakes* (no date), *E. Tuckerman* (no date), *C. G. Pringle* (1877, 1878). A viviparous form has been collected: Sargent Purchase, Alpine Garden, *P.* 1742 (1902).

CALAMAGROSTIS Adans. Reed Bent Grass.

Calamagrostis Pickeringii Gray (including var. *debilis* (Kearney) Fern. & Wieg. and var. *lacustris* (Kearney) Hitchc.). Southern peaks; local elsewhere.—Lancaster, *P.* 12272 (1909); Shelburne, Dream Lake, *P.* 19216 (1923); Sargent Purchase, near Lakes of the Clouds, *E. & C. E. Faxon* (1885), *W. W. Eggleston* (1901); Cutts Grant, Stony Plain, *E. & C. E. Faxon* (1890), Mt. Monroe, *E. & C. E. Faxon* (1877, 1885), head of Oakes Gulf, *E. & C. E. Faxon* (1877, 1882, 1890), *F. H. Horsford* (no date). Alpine region, *Oakes* (no date); White Mts., *C. G. Pringle* (1877).

Calamagrostis canadensis (Michx.) Nutt. Blue-joint. Meadows, common.—Milan, *Deane* (1916); Randolph, *Williams* (1894), *P.* 1726 (1902), 10853 (1907); Shelburne, *Deane* (1883, 1909, 1913, 1915, 1919); Low & Burbank Grant, Madison Huts, *A. S. Hitchcock* (1917); Thompson & Meserve Purchase, Carriage Road, 4000 ft., *Deane* (1884); Crawford Purchase, road from Fabyans to Base Station, *Williams* (1897); Carroll, Crawford's, *E. & C. E. Faxon* (1895).

Calamagrostis canadensis (Michx.) Nutt., var. **robusta** Vasey (*cf. Rhod.* 24 (1922), 143). Commoner than the preceding, and found also on exposed mountain ledges.—Columbia, Lime Pond, *P.* 14000 (1912); Stratford, dry ledges of North Percy Peak, *P.* 12732 (1910); Dummer, *P.* 16278 (1914); Gorham, dry ledges, Mt. Hayes, *P.* 12813 (1910); Bean Purchase, summit of Carter Notch, *E. & C. E. Faxon* (1890), North Baldface Mt., *P.* 16037 (1914); Pinkham Grant, *P.* 10718 (1907); Randolph, *P.* 10857 (1907), 14430 (1913); Low & Burbank Grant, Ravine of the Castles, *Williams* (1896), Madison Spring, *A. P. Chadbourne* (1884), *T. O. Fuller* (1886), *P.* 166 (1900), Cape Horn, *E. & C. E. Faxon*, *Williams* (1896), *B. L. Robinson* (1901); Sargent Purchase, Alpine Garden, *Williams* (1895); White Mts., not definitely located, *E. Tuckerman* (no date); Bean Grant, Crawford Path, *G. G. Kennedy* (1891), *E. & C. E. Faxon* (1895), Mt. Webster, *P.* 11713 (1908); Carroll, Crawford's, *J. R. Churchill* (1895), *A. S. Hitchcock* (1902).

Calamagrostis canadensis (Michx.) Nutt., var. **Langsdorfi** (Link) Inman (*cf. Rhod.* 24 (1922), 143). Alpine meadows.—

Thompson & Meserve Purchase, 5-mile sign on Mt. Washington Carriage Road, *E. & C. E. Faxon* (1895), *P.* 2531, 3194 (1903), 12835 (1910); Sargent Purchase, summit of Mt. Washington, *G. G. Kennedy* (1891), Bigelow Lawn, *W. W. Eggleston* (1898), Tuckerman Ravine, *G. G. Kennedy* (1895), Lakes of the Clouds, *W. Boott* (1855, 1865); Mt. Washington, not definitely located, *J. A. Allen* (1878); White Mts., not definitely located, *H. Mann* (1862), *C. G. Pringle, E. & C. E. Faxon* (1877).

Calamagrostis neglecta (Ehrh.) Gaertn., Mey., & Scherbius. Open ledges, local.—Hadley Grant, Mt. Crawford, *P.* 11695 (1908). Perhaps to be referred here are specimens collected by *E. Faxon* and *C. G. Pringle* in Sargent Purchase, 'Grand Gulf,' (1877).

CINNA L. Wood Reed Grass.

Cinna latifolia (Trev.) Griseb. Damp woods, common.—(Pittsburg); (Clarksville); Dartmouth College Grant, *P.* 16272 (1914); Dixville Notch, *Deane* (1917); (Stewartstown); (Columbia); (Millsfield); Cambridge, *P.* 18199 (1921); (Stratford); (Stark); (Berlin); (Lancaster); Jefferson, *P.* 16900 (1916); Randolph, *P.* 2871 = *M.* 1444 (1903), *M.* 1447 (1903), *P.* 4181 (1904), 11776 (1908); Gorham, *Deane* (1884); Shelburne, *Deane* (1914); Carroll, Crawford's, *E. & C. E. Faxon* (1882), *Williams* (1894); Low & Burbank Grant, Mt. Adams, 4700 ft., *P.* 2870 (1903), Jefferson Notch, *Deane* (1917); (Thompson & Meserve Purchase); Sargent Purchase, Mt. Washington, *D. C. Eaton* (1858); Cutts Grant, Oakes Gulf, *Williams* (1896); Green Grant, *W. Boott* (1855); (Pinkham Grant); (Bean Purchase).

GINANNIA F. G. Dietr.

Ginannia lanata (L.) Hubbard (*Holcus lanatus* L.; *cf. Rhod.* 18 (1916), 234). Velvet Grass. Rarely introduced in meadows.—Lancaster, *P.* 16378 (1915); Randolph, lawn, *P.* 16291 (1914).

SPHENOPHOLIS Scribn.

Sphenopholis pallens (Spreng.) Scribn. (including var. *major* (Torr.) Scribn.). Ledges and banks, not infrequent but seldom abundant.—Dartmouth College Grant, Gorge of Diamond River, *P.* 10512 (1907); Colebrook, *P.* 10912 = *M.* 4005 (1907), *P.* 13993, 13994 (1912), *F. & P.* 16929 (1917); Columbia, *P.* 10446 = *M.* 3864

(1907), *F. & P.* 16794 (1917); Northumberland, *F. & P.* 16832 (1917); Stark, *P.* 12725 (1910), Devil's Slide, *P.* 17453 (1919); Milan, *P.* 13793 (1912); Lancaster, Mt. Prospect, *P.* 14224 (1913); Jefferson, near Cherry Pond, *P.* 14423 (1913); Randolph, near Peek Park, *P.* 14457 (1913); Gorham, *F. & P.* 16845 (1917).

TRISETUM Pers.

Trisetum spicatum (L.) Richt., var. **molle** (Michx.) Piper (*Rhod.* 18 (1916), 197). Damp ledges by streams and in sandy alluvium, frequent.—Atkinson & Gilmanton Academy Grant, Hellgate, *P.* 12596 (1910); Dartmouth College Grant, Gorge of Diamond River, *P.* 10499 (1907); Berlin, near B. & M. station, *P.* 10384 (1907), *M.* 4506 (1908); Gorham, Alpine Cascade, *Deane* (1884), *P.* 11307 (1908), riverbank, *P.* 16707 (1916); Shelburne, *P.* 11156 = *M.* 4151 (1908), *Deane* (1913, 1914); Martin Location, *P.* 17207 (1918); Green Grant, *P.* 13909 (1912); Stewartstown, ledge near river, *F. & P.* 17012 (1917); Stark, near Percy, *P.* 14146 (1913), 16751 (1916).

Trisetum spicatum (L.) Richt., var. **pilosiglume** Fern. (*Rhod.* 18 (1916), 195–196). Alpine meadows, local.—Thompson & Meserve Purchase, Great Gulf, *E. & C. E. Faxon* (1877, 1887), *P.* 12884 (1910); Sargent Purchase, Alpine Garden, *E. & C. E. Faxon* (1877), *J. R. Churchill* (1895), *Williams* (1895, 1896), *P.* 10601 (1907), Huntington Ravine, Fan, *P.* 13897 (1912); alpine region not definitely located, *Tuckerman* (no date); Mt. Washington, *E. & C. E. Faxon* (1878).

DESCHAMPSIA Beauv.

Deschampsia flexuosa (L.) Trin. Hair Grass. Dry sandy or rocky places, common in the southern part of the County.—Berlin, Mt. Forist, *P.* 16123 (1914); Gorham, Pine Mt., *P.* 16290 (1914); Shelburne, *Deane* (1917); Carroll, Fabyans, *A. Brown* (1880), *P.* 11268 (1908), Cherry Mt. Road, *P.* 14325 (1913); Low & Burbank Grant, Mt. Adams, *P.* 3021 (1903), 4069 (1904); Thompson & Meserve Purchase, Mt. Madison, *Williams* (1894), Mt. Adams, *E. & C. E. Faxon* (1878), Northern Peaks, *M.* 1059 (1903), 1919 (1904), Great Gulf, *E. & C. E. Faxon* (1897), Mt. Washington, *Deane* (1884), *J. R. Churchill* (1890); Sargent Purchase, Mt. Washington, *D. C. Eaton* (1858), *W. F. Flint & J. H.*

Huntington (1876), *J. R. Churchill* (1895), Tuckerman Ravine, *H. Mann* (1862); Cutts Grant, Oakes Gulf, *J. R. Churchill, Williams* (1895); Bean Grant, Mt. Webster, *P.* 11749 (1908); Martin Location, *P.* 14263 (1913); Green Grant, *P.* 17107 (1918); Bean Purchase, Imp Camp, *P.* 16762 (1917), Mt. Wildcat, *P.* 6393 (1904).

Deschampsia caespitosa (L.) Beauv. Rocky beaches of the larger streams and lakes, frequent.—Stewartstown, riverbank, *F. & P.* 16800 (1917); Northumberland, riverbank, *P.* 12174 (1909); Dalton, Cushman, riverbank, *P.* 17387 (1919); Dartmouth College Grant, Gorge of Diamond River, *P.* 10512½ (1907); Errol, Pine Point, Lake Umbagog, *P.* 10515 (1907); (Cambridge); Dummer, *P.* 12663 (1910); Gorham, *P.* 12257 (1909); Shelburne, *Deane* (1884, 1913, 1914).

Deschampsia atropurpurea (Wahl.) Scheele. Alpine meadows, local.—Low & Burbank Grant, King Ravine, *P.* 14402 (1913); Thompson & Meserve Purchase, Great Gulf, *E. Faxon* (1882), *E. & C. E. Faxon* (1885, 1895, 1896), *P.* 12883 (1910), Cape Horn, *E. & C. E. Faxon* (1895); Sargent Purchase, Mt. Washington, summit, *Deane* (1897), *Eggleston* (1899), Huntington Ravine, *P.* 16750 (1917), Raymond Cataract, *P.* 13914 (1912), Tuckerman Ravine, *E. & C. E. Faxon* (1886), *T. O. Fuller* (1894), *Williams* (1895), *P.* 11548 (1908); Cutts Grant, Oakes Gulf, *F. L. Scribner* (1882), *J. R. Churchill, Williams* (1895), *E. & C. E. Faxon* (1896), *P.* 12040 = *M.* 4543 (1909). Also White Mts., *W. Oakes* (no date), *E. Tuckerman* (no date), *A. Gray* (1842).

AVENA [Tourn.] L. Oats.

Avena sativa L. Railroad tracks, dumps, and waste ground, frequent.—(Lancaster); Whitefield, *Deane* (1897), *P.* 11555 = *M.* 4432, 4410 (1908), *M.* 5048 (1913); (Jefferson); Randolph, *M.* 4518 (1908), *P.* 12849 (1910); Success, *P.* 10776 (1907); Berlin, Bog Dam, *M.* 3211 (1906); Gorham, *M.* 4263 (1908); Shelburne, *Deane* (1902), *P.* 11652 (1908).

DANTHONIA DC. Wild Oat Grass.

Danthonia spicata (L.) Beauv. Open places in dry soil, very common.—Pittsburg, near Canaan line, *P.* 11021 = *M.* 3756 (1907); (Clarksville); Dartmouth College Grant, *P.* 16166 (1914);

Stewartstown, *P.* 10145 = *M.* 3689 (1907), *M.* 3966 (1907); (Colebrook); Columbia, *P.* 10440 = *M.* 3850 (1907), *M.* 3871 (1907); (Errol); (Stratford); (Stark); Milan, *P.* 13765, 13816 (1912); (Success); Berlin, *P.* 4005 (1904), 16122 (1914); (Kilkenny); (Lancaster); Dalton, *M.* 4385 (1908); Whitefield, *Deane* (1896); Jefferson, *P.* 16700 (1917); Randolph, *P.* 3144 (1903), 4102 (1904), *M.* 4219 (1908); Gorham, *W. C. Cusick* (1887), *M.* 4287 (1908); Shelburne, *M.* 4115 (1908), *Deane* (1909, 1913, 1914); (Carroll); (Low & Burbank Grant); Thompson & Meserve Purchase, Jacob's Ladder, *E. & C. E. Faxon* (1895), Halfway House, *P.* 12817 (1910); Sargent Purchase, Carriage Road, *P.* 13899 (1912); Martin Location, *P.* 14314 (1913).

Danthonia compressa Aust. Shaded gravelly roadsides, frequent in the southern part of the County.—Carroll, Cherry Mtn. Road, *P.* 14324 (1913), 16814 (1916); Gorham, *P.* 17337 (1918); Martin Location, *P.* 11551 (1908); Green Grant, *P.* 13915 (1912); Pinkham Grant, *P.* 10720 (1907); Bean Purchase, Wild River valley, *P.* 16596 (1915).

ERAGROSTIS Beauv.

Eragrostis pilosa (L.) Beauv. Rarely adventive.—Randolph, railroad track west of Appalachia, *P.* 17615 (1919).

MELICA L. Melic Grass.

Melica striata (Michx.) Hitchc. Woods and meadows, not rare.—Pittsburg, near Canaan line, *P.* 10221 = *M.* 3429 (1907); (Stewartstown); Colebrook, *M.* 3827 (1907); Columbia, *P.* 11083, 10442 = *M.* 3876 (1907); Stratford, *P.* 13606 (1912); (Stark); Northumberland, *P.* 16466 (1917); Milan, *P.* 17120 (1918); Success, *P.* 10642 (1907); Berlin, *P.* 16117 (1914); Lancaster, Mt. Prospect, *P.* 14175 (1913), Mt. Tug, *P.* 16067 (1914); Dalton, *P.* 16394 (1915); Jefferson, *P.* 16371 (1915); Randolph, *P.* 11224 (1908); Gorham, *P.* 16004 (1914); Shelburne, *P.* 11173 = *M.* 4114 (1908), *Deane* (1915, 1916); Carroll, Bretton Woods, *P.* 11266 (1908); Cutts Grant, Oakes Gulf, *E. & C. E. Faxon* (1882), *C. E. Faxon* (1886), *J. R. Churchill, Williams* (1895), *P.* 11227 (1908), 12017 = *M.* 4561 (1909); Hadley Grant, Mt. Hope, *P.* 16448 (1915); Bean Purchase, *P.* 16025 (1914).

DACTYLIS L. Orchard Grass.

Dactylis glomerata L. Fields, especially in shade, rather infrequent.—Columbia, *P.* 10482 = *M.* 3922 (1907); Errol, *P.* 12648 (1910); (Berlin); Whitefield, *P.* 16670 (1916); Jefferson, *P.* 16708 (1916); Randolph, *M.* 3339 (1907), *P.* 12737 (1910); Gorham, *P.* 16677 (1916); Shelburne, *Deane* (1909); Carroll, White Mtn. House, *P.* 16647 (1916); Pinkham Grant, *P.* 13918 (1912); Bean Purchase, Wild River valley, *P.* 16021 (1914).

CYNOSURUS L. Dog's-tail Grass.

Cynosurus cristatus L. Rarely introduced in grass-seed.—Randolph, *P.* 17133 (1918).

POA L. Spear Grass.

Poa annua L. Woods and cultivated ground, common.—Pittsburg, Third Lake, *P.* 10335 = *M.* 3499 (1907); (Millsfield); Stratford, *P.* 13526 (1912); (Success); (Berlin); (Lancaster); (Dalton); Whitefield, *Deane* (1919); (Jefferson); Randolph, *Williams* (1897), *M.* 3245 (1907), *P.* 11237 (1908); (Gorham); Shelburne, *Deane* (1916); (Carroll); (Low & Burbank Grant).

Poa compressa L. Wire Grass. Cultivated and waste ground, very common.—Colebrook, *M.* 3890 (1907); (Columbia); (Stark); (Milan); (Success); (Berlin); (Kilkenny); (Jefferson); Randolph, *Williams* (1897), *P.* 3140 (1903), *M.* 4181, 4248 (1908); (Gorham); Shelburne, *Deane* (1909, 1913, 1914); Carroll, Crawford's, *Miss S. Minns* (no date); Sargent Purchase, summit of Mt. Washington, *Williams* (1901).

Poa laxa Haenke. Alpine regions, especially in rocky or gravelly soil, common.—Randolph, Madison Path at 2200 ft., *P.* 14491 (1918); Low & Burbank Grant, Knife Edge, *P.* 11287 (1909); Thompson & Meserve Purchase, Mt. J. Q. Adams, *P.* 10879, 10881 (1907), Great Gulf, *C. E. Faxon* (1879), *E. & C. E. Faxon* (1887), *Williams* (1895), *E. & C. E. Faxon* (1896), *M.* 4531 (1909), *P.* 12818, 12879 (1910), Carriage Road, *P.* 10594 (1907); Sargent Purchase, summit of Mt. Washington, *C. G. Pringle* (1877), *C. E. Faxon* (1877, 1878), *J. A. Allen* (1878), *H. A. Young* (1880), *C. E. Faxon* (1887), *J. R. Churchill* (1889, 1895), *Williams* (1893, 1895, 1896, 1901), *Deane* (1897), *B. L.*

Robinson (1901), Alpine Garden, *E. & C. E. Faxon* (1878, 1885), Huntington Ravine, *J. A. Allen* (1878), Tuckerman Ravine, *P.* 10733 (1907); alpine region, indefinitely located, *Oakes* (1825), *H. Mann* (1862), *A. P. Chute* (no date), *Miss S. Minns* (no date).

Poa glauca Vahl. Rocky ledges and boulder talus, rather local.—Thompson & Meserve Purchase, Great Gulf, *E. & C. E. Faxon* (1879); Sargent Purchase, summit of Mt. Washington, *Williams* (1901), Alpine Garden, *Williams* (1897), Huntington Ravine, Fan, *P.* 13893 (1912), 16863 (1917); Cutts Grant, Oakes Gulf, *M.* 4545 (1909); Bean Grant, Mt. Webster, *P.* 11725 (1908).

Poa nemoralis L. Meadows and waste ground, infrequent.—Northumberland, east of Coös Junction, *P.* 16756 (1916); Milan, *P.* 17123 (1918); Jefferson, *P.* 16532 (1917); Berlin, dump, *P.* 14499 (1913); Gorham, *P.* 11489 (1908); Randolph, *P.* 17180 (1918), 19079 (1922); Sargent Purchase, summit of Mt. Washington, *Williams* (1901).

Poa palustris L. (*P. triflora* Gilib.; *cf. Rhod.* 18 (1916), 235). Wet meadows, common.—Pittsburg, First Lake, *P.* 10283 = *M.* 3567 (1907); Stewartstown, *F. & P.* 16727 (1917); Colebrook, *P.* 10908 = *M.* 4008 (1907); Berlin, *P.* 16430, 16523 (1915); Dalton, *P.* 18145 (1921); Jefferson, *P.* 16386 (1915), 16886 (1916), 19075 (1922); Low & Burbank Grant, Jefferson Notch Road, *Deane* (1917), *P.* 17939 (1920); Randolph, *Williams* (1897), *P.* 12052 (1909), 16836 (1917); Gorham, *P.* 14165 (1913); Shelburne, *Deane* (1909); Green Grant, Glen House, *W. Boott* (1855).

Poa pratensis L. Kentucky Blue Grass. Meadows and roadsides, everywhere; certainly native in the alpine regions.—Pittsburg, First Lake, *P.* 10277, 10186 = *M.* 3546, 3557, *P.* 10144 = *M.* 3661 (1907); Colebrook, *M.* 3902 (1907); Columbia, *P.* 10441 = *M.* 3848, 3863, 3865 (1907); Stratford, *P.* 13449, 13623 (1912); (Stark); (Northumberland); (Success); (Berlin); Whitefield, *Deane* (1896); (Jefferson); Randolph, *M.* 996 (1903), *P.* 10234 = *M.* 3373 (1907), *P.* 11238 (1908); (Gorham); Shelburne, *Deane* (1909, 1913); (Carroll); Thompson & Meserve Purchase, *M.* 4350 (1909), *P.* 12855 (1910), Great Gulf, *E. & C. E. Faxon* (1895), Great Pasture, *W. Boott* (no date); Sargent Purchase, Mt. Washington, *C. G. Pringle* (1877, 1878), Alpine Garden, *E. Faxon*

(1877), *E. & C. E. Faxon* (1879, 1881), *C. E. Faxon* (1882), *Williams* (1895, 1896), *P.* 10554 (1907), Huntington Ravine, *F. & P.* 16876 (1917), Tuckerman Ravine, *Miss S. Minns* (no date); Cutts Grant, Oakes Gulf, *P.* 12038 = *M.* 4546 (1909); Bean Grant, Mt. Clinton, *Williams* (1895); Martin Location, *P.* 14252 (1913).

Poa trivialis L. Rare.—Berlin, talus of Mt. Forist, *P.* 16128 (1914).

Poa debilis Torr. Rich woods, very local.—Lancaster, Mt. Prospect, *P.* 14173 (1913).

Poa saltuensis Fern. & Wieg. (*Rhod.* 20 (1918), 122). Rich woods, occasional; one station in alpine meadow.—Pittsburg, Second Lake, *P.* 10219 (1907); Atkinson & Gilmanton Academy Grant, *P.* 12590 (1910); Dummer, *P.* 12661 (1910); Stark, *P.* 17361 (1919); Jefferson, *P.* 16504 (1917); Randolph, *P.* 11283 (1908); Gorham, *P.* 16362 (1915); Shelburne, Mt. Cabot, *Deane* (1917); Carroll, *P.* 11265 (1908), 16692 (1916); Cutts Grant, head of Oakes Gulf, *C. E. Faxon* (1878), *E. & C. E. Faxon, Williams, J. R. Churchill* (1895), *P.* 12057 (1909).

Poa saltuensis Fern. & Wieg., var. **microlepis** Fern. & Wieg. (*Rhod.* 20 (1918), 124). Less frequent than the typical form.—Pittsburg, River Road, *P.* 10082 = *M.* 3682 (1907); Dartmouth College Grant, *P.* 12602, 12625 (1910).

Poa alsodes Gray. Alluvial woods, frequent.—Pittsburg, near Third Lake, *P.* 10328 = *M.* 3507 (1907), near Second Lake, *P.* 10271 (1907); Stewartstown, Little Diamond Pond, *P.* 12614 (1910); Colebrook, Beaver Falls, *P.* 10462 = *M.* 3900 (1907); Errol, near Munn Pond, *P.* 12660 (1910); Lancaster, *P.* 17104 (1918); (Jefferson); Randolph, *P.* 11284 (1908); Gorham, *P.* 16011 (1914); Carroll, Fabyans, *C. E. Faxon* (1879), Twin Mt., *P.* 16655 (1916).

GLYCERIA R. Br. Manna Grass.

Glyceria melicaria (Michx.) Hubbard (*G. Torreyana* (Spreng.) Hitchc.; *cf. Rhod.* 14 (1912), 186). Damp woods, common.—Stewartstown, *P.* 10983 = *M.* 3700 (1907), *F. & P.* 16776 (1917); Colebrook, *P.* 10388 = *M.* 3951 (1907); (Columbia); Odell, *P.*

16304 (1914); Milan, *P.* 13736 (1912); Success, *P.* 16537 (1917); Dalton, *P.* 17843 (1920); Jefferson, *P.* 16890 (1917); Randolph, *P.* 1622 (1902); Gorham, *W. Boott* (1853), *Deane* (1916); Shelburne, *Deane* (1884); (Carroll); (Low & Burbank Grant); Thompson & Meserve Purchase, Great Gulf, *P.* 1611 (1902), Madison Ravine, *P.* 16492 (1915); (Sargent Purchase); Bean Grant, Mt. Clinton, *Williams* (1895), *M.* 0 (1901); Martin Location, *P.* 14284 (1913); Green Grant, *W. Boott* (1855); Pinkham Grant, *P.* 17645 (1919).

Glyceria canadensis (Michx.) Trin. Wet meadows and bogs, frequent.—Pittsburg, west of Indian Stream, *P.* 10949 = *M.* 3752 (1907); (Clarksville); Dartmouth College Grant, *P.* 16181 (1914); Stewartstown, cedar bog, *F. & P.* 16781 (1917); Colebrook, *M.* 3910 (1907); (Columbia); (Errol); Northumberland, *P.* 17175 (1918); (Berlin); Whitefield, *P.* 14236 (1913); (Jefferson); Randolph, *Williams* (1897), *P.* 9973 (1906), 11648 (1908), *M.* 4593 (1909); Shelburne, *Deane* (1883, 1915); (Carroll); Martin Location, *P.* 14256 (1913); (Pinkham Grant).

Glyceria nervata (Willd.) Trin. Damp woods and meadows, common.—Stewartstown, *M.* 3667 (1907); Colebrook, *P.* 11046, 11041 = *M.* 3823 (1907); (Columbia); Dummer, *P.* 12655 (1910); (Stark); (Milan); (Success); (Lancaster); Whitefield, *Deane* (1896); (Jefferson); Randolph, *P.* 171 (1901), *M.* 1024 (1903), 3270 (1907), *P.* 10774 (1907), *M.* 4196 (1908); Shelburne, *Deane* (1903, 1913); Carroll, *P.* 14379 (1913), near Fabyans, *E. & C. E. Faxon* (1882); Bean Grant, Mt. Clinton, *Williams* (1895); Martin Location, *P.* 14289 (1913).

Glyceria nervata (Willd.) Trin., var. **stricta** Scribn. Occasional.—Pittsburg, First Lake, *P.* 10279 = *M.* 3553 (1907); Sargent Purchase, Tuckerman Ravine, head wall, *P.* 11543 (1908).

Glyceria grandis Wats. Meadows and ditches, common.—(Clarksville); Dartmouth College Grant, *P.* 16144 (1914); Stewartstown, *P.* 10087 (1907); Colebrook, *P.* 10906 = *M.* 4025 (1907); (Columbia); (Stratford); (Stark); Whitefield, *P.* 14466 (1913); Jefferson, *P.* 16401 (1915); Randolph, *Williams* (1895, 1897), *M.* 4036 (1907), *P.* 10832 (1907); (Gorham); Shelburne, *Deane* (1883, 1884, 1913); (Carroll); (Martin Location).

Glyceria Fernaldii (Hitchc.) St. John (*G. pallida* (Torr.) Trin., var. *Fernaldii* Hitchc.; *cf. Rhod.* 19 (1917), 75–76). Muddy ground, frequent.—Pittsburg, *P.* 17694 (1919); Dix Grant, valley of Swift Diamond River, *P.* 16134 (1914); Stewartstown, Buck Pond, *F. & P.* 16802 (1917); Colebrook, *P.* 10297 = *M.* 4021 (1907); Columbia, Fish Pond, *P.* 16834 (1917); Berlin, Dead River, *P.* 1448 (1913); Lancaster, Israel River, *P.* 12786 (1910); Dalton, *P.* 11791 = *M.* 4364 (1908); Whitefield, Weed Pond, *P.* 14409 (1913); (Jefferson); Randolph, *P.* 10768 (1907), *M.* 4586 (1909); Shelburne, *Deane* (1918); Martin Location, *P.* 14260 (1913).

Glyceria borealis (Nash) Batchelder. Shallow water and marshy shores, frequent.—(Pittsburg); Clarksville, Clarksville Pond, *P.* 10953 = *M.* 3708 (1907); Colebrook, *P.* 10477 (1907); Columbia, *F. & P.* 16792 (1917); (Stratford); Milan, *P.* 13846 (1912); Whitefield, *Deane* (1896); Randolph, *Williams* (1895), *P.* 1613 (1902); Gorham, *P.* 17384 (1919); Shelburne, *Deane* (1884).

FESTUCA L. Fescue.

Festuca rubra L. Rare.—Shelburne, *Deane* (1909).

Festuca rubra L., var. **prolifera** Piper. Heads of alpine ravines, local.—Thompson & Meserve Purchase, Great Gulf, *E. & C. E. Faxon* (1887), *J. R. Churchill* (1895), *Williams* (1895, 1896), *E. & C. E. Faxon* (1896), *P.* 12878 (1910); Sargent Purchase, Alpine Garden, *E. & C. E. Faxon*, *Williams* (1897); Mt. Washington, less definitely located, *Oakes* (no date), *Tuckerman* (no date), *C. G. Pringle* (1877), *E. Faxon* (1877), *C. E. Faxon* (1878).

Festuca rubra L., var. trichophylla Gaud. Rare.—Whitefield, railroad ditch at station, *Deane* (1916).

Festuca ovina L. Fields and roadsides, occasional.—Whitefield, *P.* 16669 (1916); Randolph, *P.* 17090 (1918), railroad west of Bowman, *P.* 16355 (1915); Gorham, Dixon's, *P.* 16000 (1914); Shelburne, *Deane* (1909).

Festuca ovina L., var. duriuscula (L.) Koch. More common.—Stark, *P.* 14134 (1913); Carroll, *P.* 11270 (1908), Cherry Mt. Road, *P.* 14381 (1913), Fabyans, *P.* 16660 (1916); Gorham,

P. 16129 (1914), Dixon's, *P.* 12524 (1909); Shelburne, *P.* 11154, 11155 = *M.* 4144, 4157 (1908), *Deane* (1909, 1911, 1915), *Mrs. G. N. McMillan* (1912); Martin Location, *P.* 12847 (1910); Green Grant, *P.* 12016 (1909).

Festuca capillata Lam. (*F. ovina* L., var. *capillata* (Lam.) Hack.; *cf. Rhod.* 18 (1916), 235). Rarely adventive.—Randolph, gravelly driveway, *P.* 16499 (1917); Carroll, Mt. Pleasant House, *P.* 16661 (1916).

Festuca elatior L. Meadows, frequent.—Stewartstown, *P.* 10086 = *M.* 3668 (1907); Colebrook, *M.* 3994 (1907); (Columbia); (Success); Milan, *P.* 13702 (1912); (Lancaster); Dalton, *P.* 17389 (1919); (Jefferson); Randolph, *M.* 4201 (1908), *P.* 12054 (1909); Gorham, *Deane* (1911); (Carroll).

Festuca nutans Spreng. Rich woods, local.—Lancaster, *P.* 19059 (1922), slopes of Mt. Tug, *P.* 16068 (1914).

BROMUS L. Brome Grass.

Bromus secalinus L. Introduced in waste ground, rare.—Whitefield, *Deane* (1895), *P.* 19084 (1922); Randolph, *P.* 10743 (1907).

Bromus ciliatus L. Moist woods and roadsides, common.—Pittsburg, First Lake, *P.* 10098 = *M.* 3657 (1907); Clarksville, *F. & P.* 17050 (1917); Dartmouth College Grant, *P.* 16195 (1914); Stewartstown, *P.* 10405 = *M.* 3968 (1907); Colebrook, *P.* 10478 = *M.* 3911, *P.* 10932 = *M.* 3983 (1907); (Columbia); (Stratford); (Stark); (Northumberland); Milan, *P.* 13809 (1912); (Success); (Berlin); (Kilkenny); Lancaster, *P.* 17620 (1919), Mt. Prospect, *P.* 16927 (1917); (Dalton); Whitefield, *Deane* (1897), *P.* 11562 (1908); Jefferson, *W. Boott* (1873); Randolph, *E. Faxon* (1878), *E. & C. E. Faxon* (no date), *Williams* (1894, 1897), *P.* 10858 (1907), 17177 (1918); Gorham, *M.* 1448 (1903); Shelburne, *Deane* (1883, 1914); Carroll, Crawford's, *J. A. Lowell* (no date); (Low & Burbank Grant); Thompson & Meserve Purchase, Carriage Road, *T. O. Fuller* (1883); Sargent Purchase, Huntington Ravine, Fan, *F. & P.* 16878 (1917); Martin Location, *P.* 14288 (1913); Green Grant, Glen House, *W. Boott* (1855); (Pinkham Grant).

Bromus altissimus Pursh. Alluvial woods of the Connecticut valley.—Stewartstown, south of West Stewartstown, *F. & P.* 17042 (1917); Stratford, near North Stratford, *F. & P.* 17030 (1917).

LOLIUM L. Darnel.

Lolium perenne L. Introduced in grass seed, rare.—Randolph, *P.* 16559 (1917), 17091 (1918).

Lolium multiflorum Lam. Introduced in grass seed, rare.—Randolph, *P.* 17086 (1917).

AGROPYRON Gaertn.

Agropyron repens (L.) Beauv. Quitch Grass. Fields and meadows, extremely abundant and variable, in length of awns, size of spikelets, pubescence, and color of plant.—(Pittsburg); Colebrook, *P.* 10390 = *M.* 3928 (1907); (Columbia); (Stratford); (Stark); Milan, north of Copperville, *P.* 17826 (1920) very bluish-glaucous; (Success); (Berlin); (Jefferson); Randolph, *Williams* (1897), *P.* 1708, 1730 (1902), *M.* 4198 (1908), *P.* 16888 (1917), 17195, 17196, 17197, 17198, 17199, 17200 (1918); Gorham, *W. C. Cusick* (1887); Shelburne, *Deane* (1883, 1909, 1914, 1917 with some double spikelets); (Carroll); (Low & Burbank Grant); Green Grant, Glen House, *W. C. Cusick* (1887).

Agropyron caninum (L.) Beauv. Rare.—Randolph, *P.* 16887 (1917).

Agropyron caninum (L.) Beauv., f. **pubescens** (Scribn. & Sm.) Pease & Moore (*Rhod.* 12 (1910), 71). Rare.—Milan, 4 miles south of West Milan, *P.* 13798 (1912).

Agropyron caninum (L.) Beauv., var. **Hornemanni** (Koch) Pease & Moore (*A. biflorum* (Brignoli) R. & S.; *cf. Rhod.* 12 (1910), 73). Damp alpine meadows and heads of ravines, local.—Sargent Purchase, Alpine Garden, *C. E. Faxon* (1885, 1896), *E. & C. E. Faxon* (1896), *Williams* (1896), *B. L. Robinson* (1901), *P.* 10600 (1907), Huntington Ravine, Fan, *P.* 13898 (1912), outlet of Lakes of the Clouds, *B. L. Robinson* (1901); Cutts Grant, Mt. Monroe, *C. G. Pringle* (1878), Oakes Gulf, *E. & C. E. Faxon* (1877, 1879, 1882), *J. R. Churchill* (1895), *Williams* (1896), *F. H.*

Horsford (no date). "In alpinis Montium Alborum," *E. Tuckerman* (no date).

Agropyron caninum (L.) Beauv., var. **tenerum** (Vasey) Pease & Moore (*A. tenerum* Vasey; *cf. Rhod.* 12 (1910), 71). Cliffs and rocky talus slopes, local.—Dartmouth College Grant, Diamond Peaks, *P.* 10501 (1907); Stark, talus of Devil's Slide, *P.* 17448 (1919); Shelburne, *Deane* (1914); Bean Grant, talus of Mt. Webster, *P.* 11722 (1908). There should probably be referred here a form with glaucous leaves and sheaths: Berlin, ledges near Jasper Cave, *P.* 14480 (1913).

Agropyron caninum (L.) Beauv., var. **tenerum** (Vasey) Pease & Moore, f. **ciliatum** (Scribn. & Sm.) Pease & Moore (*Rhod.* 12 (1910), 72). Woods and roadsides, frequent.—Northumberland, *F. & P.* 16715 (1917); Whitefield, Hazen Junction, *P.* 14426 (1913); Dalton, Dalton Mtn., *P.* 11590 = *M.* 4386 (1908); Carroll, *P.* 16590 (1915); Dummer, *P.* 13864 (1912); Milan, *P.* 13791 (1912); Randolph, *P.* 1730 (1902), 10769 (1907), 10614 = *M.* 4050 (1907); Gorham, *P.* 12208 (1909), 12892 (1910); Martin Location, *P.* 12848 (1910); Pinkham Grant, *P.* 10719 (1907).

SECALE [Tourn.] L. Rye.

Secale cereale L. Rarely adventive.—Shelburne, railroad track, *Deane* (1921).

TRITICUM L. Wheat.

Triticum aestivum L. Spontaneous, especially on railroad tracks, frequent.—Whitefield, *M.* 5075 (1913), awned form; Randolph, *P.* 10581 (1907), 17194 (1918); Milan, near Copperville station, *P.* 13766 (1912); Berlin, *M.* 4477, awned and unawned, 4482, awned (1908); Shelburne, *P.* 11650 (1908), awned, *Deane* (1918).

HORDEUM [Tourn.] L. Barley.

Hordeum jubatum L. Waste ground, infrequent.—Jefferson, Jefferson Junction, *P.* 16824 (1916); Randolph, *P.* 12022 (1909); Gorham, *P.* 16475 (1915).

Hordeum sativum Jessen. Occasionally spontaneous.—Randolph, *Williams* (1894); Shelburne, *Deane* (1883, 1917).

ELYMUS L. Wild Rye; Lyme Grass.

Elymus virginicus L. Riverbanks and alluvial soil, frequent.—Pittsburg, near Back Lake, *F. & P.* 17001 (1917); Dartmouth College Grant, *P.* 10511 (1907); Errol, *P.* 16281 (1914), *F. & P.* 16970 (1917); Stratford, *P.* 17650 (1919); Northumberland, *P.* 12118 (1909); Stark, *P.* 17457 (1919); Milan, *P.* 13868 (1912); Jefferson, *P.* 10801 (1907); Randolph, *P.* 4008, 4009 (1904); Gorham, *P.* 10748 (1907), 17617 (1919); Shelburne, *Deane* (1915); Martin Location, *P.* 10721 (1907).

Elymus canadensis L. Alluvial soil, rather frequent in the Connecticut valley, rare elsewhere.—Pittsburg, near Black Lake, *F. & P.* 17054 (1917); Stewartstown, *P.* 17054 (1916); Colebrook, *F. & P.* 16964 (1917); Stratford, *F. & P.* 17031 (1917), *P.* 17665 (1919); Northumberland, Lost Nation, *Williams* (1906), *P.* 12127 (1909), 17255 (1918); Lancaster, *P.* 12289 (1909); Jefferson, Boy Mt., *P.* 10010½ (1907); Dartmouth College Grant, Gorge of Diamond River, *P.* 16282 (1914).

ASPERELLA Humb. Bottle-brush Grass.

Asperella Hystrix (L.) Humb., var. **Bigeloviana** Fern. (*Hystrix patula* Moench; *cf. Rhod.* 24 (1922), 230). Rich alluvial or rocky woods; not yet known in the County from the Androscoggin basin; local.—Colebrook, *F. & P.* 16967 (1907); Stark, talus of Devil's Slide, *P.* 17454 (1919); Lancaster, woods by Israel River, *P.* 12715 (1910).

CYPERACEAE (SEDGE FAMILY).

CYPERUS [Tourn.] L. Galingale.

Cyperus rivularis Kunth. Rare.—Dalton, Cushman, *P.* 11597 = *M.* 4442 (1908).

Cyperus dentatus Torr. Rare.—Shelburne, bank of Androscoggin River, *Deane* (1913).

Cyperus filiculmis Vahl, var. macilentus Fern. Rarely adventive.—Jefferson, railroad track west of Cherry Mt., *P.* 11426 (1907).

DULICHIUM Pers.

Dulichium arundinaceum (L.) Britton. Swamps and borders of ponds, frequent.—(Stewartstown); Colebrook, *P.* 11072 = *M.*

3807 (1907); Cambridge, Lake Umbagog, *P.* 18183 (1921); Stratford, *P.* 17667, 17668 (1919); Northumberland, *P.* 17246 (1918); Milan, Mud Pond, *P.* 13782 (1912); (Success); Lancaster, Martin Meadow Pond, *P.* 17585 (1919); Dalton, *P.* 11606 = *M.* 4369 (1908); Whitefield, Weed Pond, *P.* 14408 (1913), Burns Pond, *M.* 5038 (1913); (Jefferson); Randolph, *P.* 10609 (1907); Shelburne, *Deane* (1883); Carroll, *P.* 14375 (1913).

ELEOCHARIS R. Br. Spike Rush.

(**Eleocharis Robbinsii** Oakes was published in *Hovey's Mag.* 7 (1841), 178, the first-named station being "At Pondicherry Pond, Jefferson, N. H., Dr. Robbins, July, 1829." There seems no reason to doubt the record, although the species has apparently not been collected there since the time of Robbins.)

Eleocharis olivacea Torr. Rare.—Stewartstown, Buck Pond, *P.* 17678 (1919); Jefferson, Mud Pond, *P.* 17338 (1918).

Eleocharis capitata (L.) R. Br. (not *E. tenuis* (Willd.) Schultes, *cf. Rhod.* 20 (1918), 23–24; 23 (1921), 106). Wet places, frequent.—Stewartstown, Ladd Pond, *P.* 13947 (1912), *F. & P.* 16962 (1917); Whitefield, *Deane* (1896); Randolph, *P.* 1540 (1901), *M.* 1016 (1903), *P.* 4002 (1904), 12707 (1910); Shelburne, *Deane* (1913).

Eleocharis ovata (Roth) R. & S. Wet places, frequent.—Errol, *P.* 16989 (1917); Milan, *P.* 13698 (1912); Jefferson, *P.* 10789 (1907), Little Cherry Pond, *P.* 12925 (1910); Gorham, *P.* 16864 (1916).

Eleocharis obtusa (Willd.) Schultes. Wet places, common.—Colebrook, *F. & P.* 16635 (1917); Whitefield, *Deane* (1897); Jefferson, *W. Boott* (1874); Randolph, *Williams* (1894), *P.* 2543 (1903), 4056, 4057 (1904), *M.* 4465 (1908); Gorham, *M.* 4228, 4278 (1908), *P.* 12896 (1910); Shelburne, *Deane* (1884, 1916).

Eleocharis palustris (L.) R. & S. Ponds and swamps, common.—Stewartstown, Little Diamond Pond, *P.* 12631 (1909), Connecticut River, *F. & P.* 16941 (1917); Colebrook, *F. & P.* 16952 (1917); Columbia, Lime Pond, *P.* 13978 (1912), *F. & P.* 16716, 16719 (1917), Fish Pond, *F. & P.* 16739 (1917); Cambridge, Lake Umbagog, *P.* 16548 (1915); Berlin, Head Pond, *P.* 14482

(1913); Lancaster, *P.* 12284 (1909); Whitefield, *Deane* (1896); Jefferson, Cherry Pond, *P.* 10578 (1907), 12921 (1910), 14453 (1913); Shelburne, *Deane* (1883, 1884).

Eleocharis palustris (L.) R. & S., var. **glaucescens** (Willd.) Gray. Infrequent.—Northumberland, *P.* 12172 (1909).

Eleocharis acicularis (L.) R. & S. Muddy shores, common.—(Pittsburg); (Stewartstown); (Colebrook); (Columbia); (Millsfield); (Cambridge); Stratford, *P.* 17654 (1919); Northumberland, *P.* 12141 (1909); (Berlin); Lancaster, *P.* 16657 (1917); Whitefield, *P.* 14411 (1913); (Jefferson); (Carroll); Gorham, *P.* 10811 (1907), 11649 (1908), *M.* 4298 (1919); Shelburne, *Deane* (1904, 1913).

Eleocharis nitida Fern. Boggy pastures in the calcareous regions, local.—Colebrook, road to Dixville, *F.* & *P.* 16972 (1917); Columbia, near Colebrook line, *F.* & *P.* 16796 (1917). These are the first stations in the United States for this species.

Eleocharis intermedia (Muhl.) Schultes. Very local.—Colebrook, *F.* & *P.* 16948 (1917).

STENOPHYLLUS Raf.

Stenophyllus capillaris (L.) Britton. Adventive, nearly always on railroad tracks, frequent.—Stewartstown, *P.* 14016 (1912), *F.* & *P.* 16945 (1917); Columbia, *P.* 17719 (1919); Lancaster, *P.* 12290 (1909); Dalton, Scott Junction, *P.* 12295 (1909); Whitefield, *P.* 14574 = *M.* 5079 (1913); Carroll, Twin Mt., *P.* 14470 (1913); Jefferson, Jefferson Junction, *P.* 11431 (1908); Randolph, *P.* 11712 (1908), 17614 (1919); Gorham, *P.* 12197 (1909).

SCIRPUS [Tourn.] L. Bulrush.

Scirpus pauciflorus Lightf. Boggy soil in the calcareous district, local.—Stewartstown, Ladd Pond, *P.* 10404 = *M.* 3962 (1907); Colebrook, *F.* & *P.* 16973 (1917); Columbia, Lime Pond, *F.* & *P.* 16823 (1917).

Scirpus cespitosus L., var. **callosus** Bigel. (*Rhod.* 23 (1921), 24). Bogs on mountain tops, common.—Success, Mt. Success, *P.* 11125 = *M.* 4126 (1908); Thompson & Meserve Purchase,

Starr Lake, *P.* 10238 (1907), Carriage Road, *Deane* (1884); Sargent Purchase, Mt. Washington, *F. Boott* (1816), *Oakes* (no date), *Pickering* (no date), *W. Boott* (1865), *E. D. Merrill* (1896), Alpine Garden, *E. & C. E. Faxon* (1878, 1889), *J. R. Churchill* (1895), *Williams* (1895, 1898), *P.* 10602 (1907), Lakes of the Clouds, *J. A. Allen* (1880), *W. W. Eggleston* (1901), Mt. Pleasant, *Miss S. Minns* (1883); Cutts Grant, *M.* 4549 (1909).

Scirpus hudsonianus (Michx.) Fern. Cold bogs and wet cliffs, somewhat local.—Clarksville, *P.* 11037 = *M.* 3704 (1907); Stewartstown, *P.* 10081 = *M.* 3688, *P.* 10398 = *M.* 3971 (1907); Colebrook, *P.* 10476 = *M.* 3896 (1907); Columbia, Lime Pond, *P.* 10438 = *M.* 3868 (1907); Stark, *P.* 19175 (1923); Randolph, Bowman, *P.* 10830 (1907), Ice Gulch, *P.* 250 (1902), east of station, *M.* 4208 (1908); Shelburne, *Deane* (1883, 1904), *P.* 11153 = *M.* 4155 (1908); Carroll, Crawford's, *Williams* (1895), *J. M. Greenman* (1898).

Scirpus subterminalis Torr. Ponds, rare.—Jefferson, Cherry Pond, *P.* 14452 (1913).

Scirpus Torreyi Olney. Ponds, rare.—Jefferson, Cherry Pond, *P.* 10577 (1907), 11434 (1908), 14454 (1913); Shelburne, Dream Lake, *P.* 19207 (1923).

Scirpus validus Vahl. Shallow water, not common.—Dixville Notch, *Williams* (1895); Columbia, Fish Pond, *P.* 13972 (1912), Lime Pond, *P.* 10490 = *M.* 3862 (1907), *P.* 13977 (1912); Jefferson, Cherry Pond, *P.* 10663 (1907); Shelburne, Dream Lake, *P.* 19204 (1923).

Scirpus acutus Muhl. (*S. occidentalis* (Wats.) Chase; *cf. Rhod.* 22 (1920), 55–56). Ponds, local.—Columbia, Fish Pond, *F. & P.* 16735 (1917), Lime Pond, *F. & P.* 16718 (1917).

Scirpus rubrotinctus Fern. Low ground, common.—Pittsburg, First Lake, *P.* 10962 = *M.* 3552 (1917); (Stewartstown); (Colebrook); (Stratford); (Stark); (Northumberland); (Success); (Berlin); (Dalton); Jefferson, *P.* 16488 (1917); Randolph, *Williams* (1897), *M.* 974 (1903), *P.* 10027 = *M.* 3295 (1907); Gorham, *M.* 4225 (1908); Shelburne, *Deane* (1883, 1913); Martin Location, *P.* 14316 (1913); Carroll, Fabyans, *E. & C. E. Faxon* (1879),

Crawford's, *E. & C. E. Faxon* (1879); Bean Grant, summit of Mt. Clinton, 4275 ft., *Williams* (1895).

Scirpus atrovirens Muhl., f. **sychnocephalus** (Cowles) Blake (*S. atrovirens* Muhl., var. *pycnocephalus* Fern.; *cf. Rhod.* 15 (1913), 161). Occasional.—Pittsburg, near Back Lake, *F. & P.* 16982 (1917); Milan, north of Marston's station, *P.* 13755 (1912); Berlin, some miles below Bog Dam, *P.* 13694 (1912).

Scirpus atrovirens Muhl., var. **georgianus** (Harper) Fern. (*S. georgianus* Harper; *cf. Rhod.* 23 (1921), 134). Low ground, damp roadsides, etc., common.—(Clarksville); Dartmouth College Grant, *P.* 16241 (1914); (Millsfield); Dixville Notch, *W. Boott* (1855); Colebrook, *P.* 10383 = *M.* 3939 (1907); Columbia, *P.* 13980 (1912); (Stark); Milan, *P.* 13135 (1912); (Success); (Berlin); (Lancaster); (Dalton); Whitefield, *P.* 14189 (1913); (Jefferson); Randolph, *M.* 4194 (1900), *P.* 12071 (1909); Gorham, *M.* 4060 (1907); Shelburne, *Deane* (1916).

Scirpus cyperinus (L.) Kunth. Swamps, occasional.—Stewartstown, *F. & P.* 17078 (1917), *P.* 17689 (1919); Lancaster, *P.* 16197 (1919); Jefferson, *P.* 17733 (1919).

Scirpus cyperinus (L.) Kunth, var. **pelius** Fern. Swamps, frequent.—Pittsburg, First Lake, *Mrs. A. F. Stevens* (1895); Stewartstown, *F. & P.* 17079 (1917); Milan, *P.* 13699 (1912); Berlin, Dead River, *P.* 14493 (1913); Lancaster, *P.* 14518 (1913); Dalton, *M.* 5002 (1913); Jefferson, *F. & P.* 17716, 17735 (1917); Randolph, *P.* 17604 (1919); Gorham, *P.* 17276 (1918); Bean Purchase, Carter Notch, *P.* 4061 (1904).

Scirpus cyperinus (L.) Kunth, var. **pelius** Fern., f. **condensatus** (Fern.) Blake (*Rhod.* 15 (1913), 162). Rare.—Jefferson, *P.* 17734 (1919).

Scirpus pedicellatus Fern. Swamps, occasional.—Stratford, *P.* 17656, 17659 (1919); Dummer, *F. & P.* 16976, 17080 (1917); Lancaster, Mt. Prospect, *P.* 17231 (1918), 17595 (1919); Randolph, *P.* 11679 (1908), 17603 (1919); Shelburne, *Deane* (1918).

Scirpus atrocinctus Fern. Wet meadows and bogs, common.—Pittsburg, west of Indian Stream, *P.* 10993 = *M.* 3747 (1907); (Northumberland); (Success); (Berlin); (Dalton); (Jefferson);

Randolph, *Williams* (1897), *M.* 4200 (1908), *P.* 12055 (1909); (Gorham); Shelburne, *Deane* (1883, 1902, 1913); Martin Location, *P.* 14258 (1913); Sargent Purchase, Mt. Washington, *W. W. Eggleston* (1901), Tuckerman Ravine, *M.* 5082 (1913), Gulf of Slides, *P.* 13916 (1912).

Scirpus atrocinctus Fern., f. **brachypodus** (Fern.) Blake (*Rhod.* 15 (1913), 161). With the typical form, frequent.—Dix Grant, *P.* 16136 (1914); Dalton, *P.* 16395 (1915); Carroll, Stanley Slide, *P.* 1728 (1902); Randolph, *Williams* (1894), *M.* 4204 (1908), *P.* 12013 (1909); Shelburne, *Deane* (1915); Sargent Purchase, Tuckerman Ravine, *P.* 254 (1900); Bean Grant, Carter Notch, *P.* 6410, 6411 (1904).

ERIOPHORUM L. Cotton Grass.

Eriophorum callitrix Cham. Cold bogs, especially above treeline, frequent.—(Stewartstown); Colebrook, *P.* 10929 = *M.* 4026 (1907); Northumberland, Groveton, *P.* 13551, 13561 (1912); Success, Mt. Success, *P.* 11314 = *M.* 4116 (1908); Jefferson, near Boy Mt. station, *P.* 16353 (1915); Low & Burbank Grant, Jefferson Notch, *P.* 11275 (1908); Thompson & Meserve Purchase, Star Lake, *Williams* (1893), *M.* 232 (1902), *P.* 10239, 10880 (1907), Mt. Adams, *P.* 256 (1900); Sargent Purchase, Mt. Washington, *W. F. Flint & J. H. Huntington* (1876), Lakes of the Clouds, *W. Boott* (1865), *J. R. Churchill, Williams* (1895), Mt. Pleasant, *Miss S. Minns* (1885); Bean Grant, Mt. Clinton, *C. E. Faxon* (1883); alpine region not definitely located, *Oakes* (no date), *Tuckerman* (1837, 1839), *H. Mann, J. W. Chickering* (1862).

Eriophorum gracile Roth. Cold bogs, rather rare.—Stratford, *P.* 13468 (1912); Randolph, *P.* 12062 (1909).

Eriophorum tenellum Nutt. Cold bogs, occasional.—Errol, Long Pond, *F. & P.* 16969 (1917); Milan, Mud Pond, *P.* 13779 (1912); Berlin, Dead River, *P.* 19069 (1922); Lancaster, Coös Junction, *P.* 12163 (1909); Jefferson, *P.* 12919 (1910); Carroll, Cherry Mt. Road, *P.* 14378 (1913), Crawford's, *Williams* (1895); Randolph, *M.* 4211 (1908), 4585 (1909), *P.* 12063, 12266 (1909); Shelburne, *Deane* (1883, 1913); Pinkham Grant, Dismal Pool, *P.* 13890 (1912).

Eriophorum viridi-carinatum (Engelm.) Fern. Wet meadows, common.—Pittsburg, west of Indian Stream, *P.* 11014 = *M.* 3738 (1907); Clarksville, *M.* 3708 (1907); (Stewartstown); Colebrook, *M.* 3804 (1907); Columbia, Lime Pond, *M.* 3867 (1907); Stratford, *P.* 13467 (1912); (Northumberland); (Jefferson); Randolph, *Williams* (1894), *P.* 10015 = *M.* 3274 (1907); Shelburne, *M.* 4154 (1908), *Deane* (1909); Carroll, Crawford's, *J. M. Greenman, Williams* (1898).

Eriophorum virginicum L. Bogs, frequent.—Dartmouth College Grant, *P.* 16218 (1914); Colebrook, *P.* 10928 = *M.* 4023 (1907); Stark, Percy, *P.* 16745 (1916); Berlin, Head Pond, *P.* 14483 (1913); Lancaster, Coös Junction, *P.* 12164 (1909); Randolph, near Pond of Safety, *P.* 1637, 1705 (1902); Gorham, Mascot Pond, *P.* 14074 (1912); Shelburne, *Deane* (1883), *W. C. Cusick* (1887), Wheeler Bog, *Deane* (1916); Green Grant, *P.* 13911 (1912); Bean Grant, Mt. Clinton, *P.* 12356 (1909).

RYNCHOSPORA Vahl. Beak Rush.

Rynchospora fusca (L.) Ait. f. Local.—Berlin, Head Pond, *P.* 14476 (1913); Shelburne, Dream Lake, *P.* 19217 (1923); Milan, Goose Pond, *P.* 19200 (1923); Whitefield, Weed Pond, *P.* 14415 (1913).

Rynchospora alba (L.) Vahl. Bogs, frequent.—Dartmouth College Grant, *P.* 16199 (1914); Stewartstown, Buck Pond, *P.* 17677 (1919); Milan, Mud Pond, *P.* 13778 (1912); Berlin, Head Pond, *P.* 13761 (1912), York Pond, *P.* 17167 (1918); Gorham, *Deane* (1884), Mascot Pond, *P.* 14060 (1912); Randolph, near Pond of Safety, *P.* 1602, 1607 (1902); Whitefield, Weed Pond, *P.* 14407 (1913).

Rynchospora capitellata (Michx.) Vahl (*R. glomerata* of *Manual; cf. Rhod.* 20 (1918), 28). Rare.—Berlin, Head Pond, *P.* 14486 (1913).

MARISCUS [Haller] Zinn. Twig Rush.

Mariscus mariscoides (Muhl.) Kuntze (*Cladium mariscoides* (Muhl.) Torr.; *cf. Rhod.* 25 (1923), 49–54). Rare.—Milan, Mud Pond, *P.* 13764 (1912).

CAREX [Ruppius] L. SEDGE.

Carex scoparia Schkuhr (including var. *condensa* Fern.). Low ground, very common.—Colebrook, *P.* 1104 = *M.* 3802 (1907); (Dummer); (Milan); (Success); (Lancaster); Whitefield, *Deane* (1895); Jefferson, *P.* 10686 (1907), 16523, 16839 (1917); Randolph, *Williams* (1897), *P.* 4054 (1904), 12755, 12757 (1910), 16725 (1917); Gorham, *M.* 4226 (1908); Shelburne, *Deane* (1883, 1913); Martin Location, *P.* 14337 (1913); (Low & Burbank Grant); Carroll, Fabyans, *J. R. Churchill* (1895).

Carex scoparia Schkuhr, var. **subturbinata** Fern. & Wieg. (*Rhod.* 14 (1912), 116). Rare.—Jefferson, near Lancaster line, *F. & P.* 16667 (1917).

Carex tribuloides Wahlenb. Moist ground, not common.—Pittsburg, First Lake, *P.* 10167 (1907); Randolph, *Williams* (1897); Carroll, Bretton Woods, *G. G. Kennedy* (1897); Thompson & Meserve Purchase, Mt. Washington R. R., 4500 ft., *E. & C. E. Faxon* (1887).

Carex tribuloides Wahlenb., var. **turbata** Bailey. Rare.—Pittsburg, shore of First Lake, *P.* 10280 (1907).

Carex projecta Mackenzie (*C. tribuloides* Wahlenb., var. *reducta* Bailey; *cf. Rhod.* 23 (1921), 235). Damp ground, very common.—Pittsburg, near Canaan line, *P.* 11020 (1907); Dartmouth College Grant, *P.* 16268 (1914); Colebrook, *P.* 10910 = *M.* 4009 (1907); (Columbia); (Millsfield); (Stark); Milan, *P.* 13750 (1912); (Success); Lancaster, *P.* 16385 (1915); Whitefield, *Deane* (1896); Jefferson, *P.* 16525 (1917); Randolph, *Williams* (1897), *P.* 5750 (1904), 10045 (1907), 12753, 12754 (1910); Shelburne, *Deane* (1913); (Carroll); Low & Burbank Grant, Madison Huts, 4800 ft., *P.* 3440 (1903); Thompson & Meserve Purchase, Madison Ravine, *P.* 16494 (1915), Base Station, *E. & C. E. Faxon* (1878); Sargent Purchase, Huntington Ravine, 4000 ft., *F. & P.* 16754 (1917), Tuckerman Ravine, 4000 ft., *E. & C. E. Faxon* (1887); Martin Location, *P.* 14266 (1913).

Carex Crawfordii Fern. Gravelly or other open soil, common.—Dartmouth College Grant, *P.* 16169 (1914); Lancaster, *P.* 14528 (1913); Whitefield, *Deane* (1894, 1895, 1896); Jefferson, *P.* 16831 (1917); Randolph, *P.* 2508, 3196 (1903); Gorham, *P.* 14242

(1913); Shelburne, *Deane* (1903, 1913, 1916); Martin Location, *P.* 14253 (1913); Carroll, Fabyans, *C. E. Faxon* (1878), Crawford's, *Williams* (1895); Crawford Purchase, *E. & C. E. Faxon* (1878); not definitely located, Mt. Washington, *E. & C. E. Faxon* (1887).

Carex Crawfordii Fern., var. **vigens** Fern. Similar localities, frequent.—Dixville Notch, *Deane* (1917); Whitefield, *Deane* (1895); Randolph, *P.* 2506 (1903), 6403 (1904), 16894, 16895 (1917); Martin Location, *P.* 14282 (1913); Carroll, Bretton Woods, *Deane* (1897); not definitely located, Mt. Washington, above tree line, *J. R. Churchill* (1890).

Carex mirabilis Dewey. Occasional.—Carroll, Fabyans, *J. R. Churchill* (1895); Randolph, *Williams* (1897).

Carex tincta Fern. (*C. mirabilis* Dewey, var. *tincta* Fern.; *cf. Rhod.* 15 (1913), 186–187). Dry fields and roadsides, frequent.—Stewartstown, *F. & P.* 16782 (1917); (Northumberland); (Success); Whitefield, *Deane* (1896); Jefferson, *P.* 16522 (1917), *M. L. Fernald* (1917); Randolph, *M.* 994 (1903), *P.* 10694, 10695 = *M.* 3366, 3369 (1907), *P.* 12053 (1909); Shelburne, *Deane* (1911, 1917); Crawford Purchase, *E. & C. E. Faxon* (1878).

Carex tenera Dewey (*C. straminea* of *Manual; cf. Rhod.* 23 (1921), 235). Dry banks, rather rare.—Jefferson, *M. L. Fernald* (1917); Randolph, *P.* 14119 (1913), 16367 (1915).

Carex Merritt-Fernaldii Mackenzie (*C. festucacea* of *Manual; cf. Bull. Torr. Bot. Club,* 49 (1923), 370). Dry soil, infrequent.—Gorham, near Cascade village, *P.* 17861 (1920); Shelburne, *Deane* (1914).

Carex brevior (Dewey) Mackenzie (*C. festucacea* Schkuhr, var. *brevior* (Dewey) Fern.; *cf. Am. Midl. Nat.* 4 (1915), 235). Dry or rocky soil, infrequent.—Berlin, near Jasper Cave, *P.* 14479 (1913); Gorham, *P.* 16321 (1914); Shelburne, *Deane* (1913, 1914), *Miss A. Wetherbee* (1915); Randolph, *P.* 17181 (1918).

Carex Bebbii Olney. Meadows in calcareous regions, local.—Stewartstown, *F. & P.* 16779 (1917); Colebrook, *F. & P.* 16685, 16950 (1917); Columbia, Fish Pond, *P.* 13966 (1912).

Carex foenea Willd., var. **perplexa** Bailey. Rare.—Berlin, 2 miles north of town, *P.* 16522 (1915).

Carex leporina L. Dry soil, rare.—Randolph, near railroad track, *P.* 17411 (1919).

Carex aenea Fern. Open ledges, frequent.—Stratford, Percy Peaks, *P.* 12734 (1910); Northumberland, Cape Horn, *P.* 16460 (1917); Berlin, Mt. Forist, *P.* 16126 (1914); Randolph, *P.* 4007 (1904), 10032 = *M.* 3319 (1907), Ice Gulch, *P.* 16714 (1917); Gorham, *P.* 1086 (1907); Hadley Grant, Mt. Hope, *P.* 16447 (1915).

Carex echinata Murr., var. **cephalantha** Bailey (*C. stellulata* Good., var. *cephalantha* (Bailey) Fern.). Swales, occasional.—Pittsburg, First Lake, *P.* 10184 = *M.* 3575 (1907); Columbia, Fish Pond, *P.* 16738 (1917); Whitefield, *Deane* (1896); Shelburne, *Deane* (1913).

Carex echinata Murr., var. **angustata** (Carey) Bailey (*C. stellulata* Good., var. *angustata* Carey). Swales, common.—Errol, Munn Pond, *P.* 12647 (1910); Stratford, *P.* 13462 (1912); Dummer, *P.* 12656 (1910); Whitefield, *Deane* (1896); Jefferson, *P.* 16502 (1917); Randolph, *P.* 10053 = *M.* 3273 (1907), *P.* 10691 (1907), Pond of Safety, *P.* 12683 (1910); Shelburne, *Deane* (1913).

Carex interior Bailey (*C. scirpoides* Schk.). Swales, chiefly in calcareous regions, local.—Stewartstown, Ladd Pond, *F. & P.* 16773 (1917); Colebrook, *F. & P.* 16772 (1917); Columbia, Lime Pond, *P.* 10439 = *M.* 3831 (1907); Martin Location, *P.* 14254, 14302 (1913).

Carex Josselynii (Fern.) Mackenzie (*C. interior* Bailey, var. *Josselynii* Fern.). Calcareous swales, rare.—Colebrook, *F. & P.* 16734 (1917).

Carex arcta Boott. Alluvial meadows along the larger rivers, frequent.—Dartmouth College Grant, *P.* 16266 (1914); Wentworth Location, *P.* 12655 (1910); Errol, *P.* 14130 (1913), 16279 (1914), *F. & P.* 16978 (1917); Dummer, *P.* 12657 (1912); Milan, *P.* 17121 (1918); Gorham, *P.* 14241 (1913), 16360 (1915); Shelburne, *Deane* (1913, 1916); Stewartstown, *F. & P.* 16998 (1917); Stratford, *P.* 17662 (1919); Northumberland, *P.* 12167, 12173 (1909).

Carex canescens L. Bogs and damp alpine meadows, frequent.—Pittsburg, Second Lake, *P.* 10269, 10270 = *M.* 3451 (1907); Columbia, Lime Pond, *M.* 3847 (1907); Randolph, *M.* 1015 (1903), *P.* 12742 (1910); Thompson & Meserve Purchase, Peabody Spring, *P.* 10882 (1907), Northern Peaks, *M.* 1058 (1903), Great Gulf, *E. & C. E. Faxon* (1887); Sargent Purchase, Mt. Washington, *J. W. Chickering* (1877), *E. & C. E. Faxon* (1878), Alpine Garden, *E. & C. E. Faxon* (1887), Huntington Ravine, *J. A. Allen* (1878), Tuckerman Ravine, *J. R. Churchill* (1890), Gulf of Slides, *M.* 1418 (1903), Lakes of the Clouds, *J. R. Churchill* (1895), Crawford Path, *E. & C. E. Faxon* (1887).

Carex canescens L., var. **disjuncta** Fern. Bogs, common.—Pittsburg, First Lake, *P.* 10183 = *M.* 3581 (1907); (Stewartstown); Stratford, *P.* 13491 (1912); (Stark); Northumberland, *P.* 16456 (1917); (Milan); (Berlin); Lancaster, Baker Pond, *P.* 17803 (1920); Jefferson, Cherry Pond, *P.* 10529 (1907), Riverton, *P.* 16517 (1917); Shelburne, *Deane* (1913).

Carex canescens L., var. **subloliacea** Laest. Bogs, common.—Stewartstown, *M.* 3398 (1907); Lancaster, *P.* 12160 (1909); Jefferson, Boy Mt. station, *P.* 16352 (1915); Carroll, Cherry Mt. Road, *P.* 14376 (1913); Shelburne, *Deane* (1915, 1916).

Carex brunnescens Poir. Woods, moist banks, and alpine meadows, common.—Pittsburg, Second Lake, *P.* 10220 = *M.* 3425 (1907), First Lake, *P.* 10169, 10202 = *M.* 3562 (1907), *P.* 10168 = *M.* 3588 (1907); Dartmouth College Grant, *P.* 16239 (1914); Stewartstown, *M.* 3397 (1907); Stratford, *P.* 13614 (1912); Dummer, *P.* 12664 (1910); Milan, *P.* 17122 (1918); (Success); Kilkenny, Mt. Waumbek, *P.* 11097 (1907); Whitefield, *Deane* (1896); Jefferson, Boy Mt., *P.* 4006 (1904); Randolph, *P.* 10042, *M.* 3371 (1907), *P.* 12756 (1910); Shelburne, *Deane* (1909, 1913, 1914, 1917); Low & Burbank Grant, *P.* 12307 (1908), King Ravine, *P.* 14403 (1913), Mt. Madison, *P.* 221 (1901); Thompson & Meserve Purchase, Madison Spring col, *P.* 3439 (1903), Mt. Washington Carriage Road, *Deane* (1884), *Williams* (1903), Mt. Washington R. R., *J. R. Churchill* (1895); Sargent Purchase, Mt. Washington, *W. Boott* (1861), *E. & C. E. Faxon* (1878), *J. R. Churchill* (1889, 1895), *Deane* (1897), Alpine Garden, *P.* 10606 (1907), Tuckerman Ravine, *W. W. Eggleston* (1899), Lakes of the

Clouds, *J. A. Allen* (1878), Crawford Path, *E. & C. E. Faxon* (1887); Bean Grant, Mt. Clinton, *E. & C. E. Faxon* (1895); Martin Location, *P.* 14278 (1913); Bean Purchase, *M.* 5071 (1913), Carter Notch, *E. & C. E. Faxon, J. R. Churchill* (1890), North Baldface Mt., *P.* 16046 (1914); alpine regions, not definitely located, *Tuckerman* (no date), *H. Mann* (1862).

Carex bromoides Schk. Wet meadows and woods, infrequent.—Stratford, Bog Brook valley, *P.* 13608 (1912); Randolph, near Jefferson line, *P.* 16364 (1915); Carroll, Cherry Mt. Road, *P.* 14398 (1913); Crawford Purchase, *P.* 11274 (1908).

Carex Deweyana Schwein. Woods, common.—Pittsburg, near Third Lake, *P.* 10326 = *M.* 3512 (1907); Stewartstown, *P.* 10354 = *M.* 3382 (1907); Stratford, *P.* 13613 (1912); (Northumberland); Milan, *P.* 13823 (1912); Success, *P.* 10647 (1907); Lancaster, *P.* 14539 (1913); Carroll, Twin Mt., *P.* 16701 (1916); Randolph, *P.* 6397, 6398 (1904), 10056 = *M.* 3323, *M.* 3302, 3320 (1907); Shelburne, *Deane* (1916).

Carex trisperma Dewey. Mossy woods and bogs, common.—Pittsburg, Second Lake, *P.* 10266 = *M.* 3449 (1907); Dartmouth College Grant, *P.* 16207 (1914); (Stewartstown); (Colebrook); (Stark); (Northumberland); Success, *P.* 16535 (1917), Mt. Success, *M.* 4122 (1908); Berlin, *P.* 16110 (1914); Lancaster, *Deane* (1896), *P.* 12159 (1909); Randolph, *Williams* (1897), *P.* 4071 (1904), 10700 (1907); Shelburne, *Deane* (1914); Carroll, *P.* 14377 (1913), Crawford's, *Williams* (1895); Green Grant, *W. Boott* (1855).

Carex trisperma Dewey, var. **Billingsii** Knight. Boggy pond shores, local.—Stewartstown, Buck Pond, *F. & P.* 16691 (1917); Milan, Mud Pond, *P.* 13783 (1912).

Carex tenella Schkuhr. Damp woods, frequent.—Pittsburg, Third Lake, *P.* 10334 = *M.* 3488 (1907); Dartmouth College Grant, *P.* 16244 (1914); Stewartstown, *P.* 10223 = *M.* 3394 (1907); (Colebrook); Millsfield, *P.* 18200 (1921); Stratford, *P.* 13611 (1912); Milan, *P.* 13784, 13790 (1912); Success, *P.* 16538 (1917); Whitefield, *Deane* (1896); Jefferson, *P.* 16703 (1917); Randolph, *P.* 4095, 4096 (1904), 10701 (1907); Gorham, *P.* 12196 (1909); Shelburne, *Deane* (1909, 1911, 1916); Carroll, Bretton Woods, *Tuckerman* (no date); (Thompson & Meserve Purchase).

Carex rosea Schkuhr. Dry woods, infrequent.—Lancaster, Mt. Prospect, *P.* 14542 (1913); Shelburne, base of Crag, *Deane* (1916).

Carex rosea Schkuhr, var. **radiata** Dewey. Richer woods, frequent.—Pittsburg, First Lake, *P.* 10296 = *M.* 3340 (1907); Clarksville, *P.* 16273 (1914); (Columbia); (Stark); Lancaster, Mt. Tug, *P.* 16737 (1916), Mt. Prospect, *S. N. F. Sanford* (1914); Whitefield, *P.* 14232 (1913); Jefferson, *P.* 4006 (1904), 14390 (1913), 16513 (1917); Randolph, *P.* 10692 = *M.* 3372 (1907); Shelburne, *Deane* (1913); Carroll, *P.* 17414 (1919); Low & Burbank Grant, Jefferson Notch Road, *P.* 16366 (1915); Martin Location, *P.* 14267 (1913).

Carex cephaloidea Dew. Rich woods, local.—Colebrook, *F. & P.* 16965 (1917); Randolph, *P.* 12758 (1910), 17093 (1918); Carroll, near Crawford House golf links, *P.* 16772 (1916).

Carex vulpinoidea Michx. Low ground, frequent but seldom abundant; generally appearing as if adventive.—Colebrook, *P.* 14073 (1912), *F. & P.* 16688, 17022 (1917); Berlin, *P.* 16109 (1914), dump, *P.* 16503 (1915); Lancaster, *Deane* (1896), *P.* 12783 (1910), Mt. Prospect, *P.* 14180 (1913); Whitefield, *P.* 14405 (1913); Dalton, *P.* 16388 (1915); Carroll, *P.* 16583 (1915); Gorham, *P.* 17214 (1918); Shelburne, *M.* 4873 (1911).

Carex annectens Bicknell (*C. setacea* Dewey, var. *ambigua* (Barratt) Fern.; *cf. Rhod.* 24 (1922), 73–74). Rare, perhaps adventive.—Jefferson, *P.* 12689 (1910); Randolph, one clump in meadow, *P.* 19071 (1922). Mackenzie in *Bull. Torr. Bot. Club*, 50 (1923), 355–358, treats the Jefferson specimen as *C. brachyglossa* Mackenzie.

Carex diandra Schrank. Pond borders and wet meadows, Connecticut valley, local.—Stewartstown, Ladd Pond, *P.* 10402 = *M.* 3959 (1907), *F. & P.* 16837 (1917), Buck Pond, *F. & P.* 16801 (1917); Columbia, Lime Pond, *P.* 10459 = *M.* 3853 (1907); Northumberland, swale, *F. & P.* 16643 (1917).

Carex stipata Muhl. Meadows and swamps, common.—Pittsburg, First Lake, *P.* 10172 = *M.* 3570, *P.* 10195 = *M.* 3543 (1907); (Stewartstown); (Colebrook); (Columbia); Stratford, *P.* 13492 (1912); (Dummer); (Milan); (Success); (Berlin); (Dalton);

(Carroll); Jefferson, *P.* 16520 (1917); Randolph, *M.* 963 (1903), *P.* 10008 = *M.* 3275 (1907); Shelburne, *Deane* (1913, 1917); Martin Location, *P.* 14336 (1913).

Carex capitata L. Eastern alpine slope of Mt. Washington, local.—Sargent Purchase, Mt. Washington, *W. Boott* (1865), *W. F. Flint & J. H. Huntington* (1876), *C. G. Pringle* (1877, 1878), Alpine Garden, *E. & C. E. Faxon* (1877, 1878, 1880, 1887, 1895), *Williams* (1895, 1901), *J. R. Churchill* (1895), *W. W. Eggleston* (1899), *P.* 10603 (1907), 12528 (1909); alpine region not definitely located, *Oakes* (no date).

Carex crinita Lam. Swales, common.—Pittsburg, First Lake, *P.* 10121 = *M.* 3615 (1907); Stewartstown, *P.* 10257 = *M.* 3391 (1907); (Success); Whitefield, *Deane* (1896); Randolph, *P.* 1732 (1901), *M.* 1023 (1903); Gorham, *P.* 17403 (1919); Shelburne, *Deane* (1915); (Pinkham Grant).

Carex crinita Lam., var. **gynandra** (Schwein.) Schwein. & Torr. Swales and low woods, common.—(Columbia); Whitefield, *Deane* (1896, 1897), *M.* 4413 (1908); Jefferson, *P.* 16508, 16699 (1917); Randolph, *Williams* (1894), *P.* 4070 (1904), 10017 (1907), *M.* 3340 (1907); Shelburne, *Deane* (1883, 1916); Martin Location, *P.* 14342 (1913); Sargent Purchase, Carriage Road, *P.* 17480 (1919); Carroll, Crawford's, *E. & C. E. Faxon* (1895).

Carex crinita Lam., var. **minor** Boott. Rare.—Stratford, *P.* 17729 (1919); Carroll, Bretton Woods, *Williams* (1895).

Carex crinita Lam., var. **simulans** Fern. Wet woods and meadows, occasional.—Cambridge, Lake Umbagog, *Williams* (1895); Randolph, *P.* 1732 (1901); Shelburne, *Deane* (1915); Carroll, Crawford's, *W. Boott* (1853), *C. E. Faxon* (1880); Bean Grant, Mt. Clinton, *E. & C. E. Faxon*, *Williams* (1895); Thompson & Meserve Purchase, Madison Ravine, *P.* 16493 (1915).

Carex crinita × scabrata. Pittsburg, near Second Lake, *P.* 10315 (1907); Bean Grant, Mt. Clinton, *G. G. Kennedy* (1895): *cf.* W. W. Eggleston in *Rhod.* 6 (1904), 139.

Carex crinita × torta. Local.—Green Grant, near Glen House, *P.* 17099 (1918).

Carex rigida Good., var. **Bigelowii** (Torr.) Tuckerm. Omnipresent above tree-line on the Presidential Range.—Low & Bur-

bank Grant, Knife Edge, *P.* 4068 (1904); Thompson & Meserve Purchase, Mt. Madison, *P.* 220 (1901), Mt. Jefferson, *M.* 266 (1902), Great Gulf, *E. & C. E. Faxon* (1887), Carriage Road, *Deane* (1884), *J. Robinson* (1901), *Williams* (1902, 1903); Sargent Purchase, Mt. Washington, *Tuckerman* (1842), *W. Boott* (1855, 1865), *C. E. Smith* (1866), *T. Morong* (1874), *W. F. Flint & J. H. Huntington* (1876), *E. & C. E. Faxon* (1877, 1887), *J. A. Allen* (1878), summit of Mt. Washington, *W. Boott* (1853), *E. & C. E. Faxon* (1878), *Deane* (1882), *Williams* (1895, 1901), Alpine Garden, *E. & C. E. Faxon* (1887), *Williams* (1893), *J. R. Churchill* (1895), *Williams* (1896), *P.* 10605 (1907), Huntington Ravine, *E. & C. E. Faxon* (1888), *F. & P.* 16900 (1917), *A. S. Hitchcock* (1917), Tuckerman Ravine, *J. R. Churchill* (1889, 1890), Crawford Path, *E. & C. E. Faxon* (1887), Lakes of the Clouds, *J. Barratt* (1824), *J. R. Churchill* (1895); alpine region, not definitely located, *Oakes* (no date), *W. Booti* (1842), *Tuckerman* (no date), *J. Blake* (1858, 1862), *C. Dewey* (no date), *H. Mann* (1862), *J. W. Chickering* (1874, 1875), *Miss S. Minns* (no date), *C. G. Pringle* (no date).

Carex torta Boott. Rocky shores of streams, common.—Pittsburg, First Lake, *P.* 10129 = *M.* 3597 (1907); Dartmouth College Grant, Gorge of Diamond River, *P.* 12609 (1910); Stewartstown, *P.* 10259 = *M.* 3399 (1907); Stratford, *P.* 13513 (1912); Northumberland, *P.* 12175 (1909); Jefferson, *P.* 14240 (1913), 16509 (1917); Randolph, *P.* 10020, 10021 = *M.* 3288 (1907); Gorham, *P.* 12206 (1909); Bean Purchase, Wild River valley, *P.* 16028 (1914); Carroll, Fabyans, *E. & C. E. Faxon* (1878); Crawford Purchase, Upper Falls of Ammonoosuc River, *W. Boott* (1855); Thompson & Meserve Purchase, Madison Ravine, *P.* 16496 (1915).

Carex lenticularis Michx. Swales and boggy shores, not very common.—Colebrook, *F. & P.* 16687 (1917); Randolph, meadow near Ravine House, *Williams* (1897); Carroll, Crawford's, *E. & C. E. Faxon* (1879); Sargent Purchase, Tuckerman Ravine, *W. Boott* (1855), *J. R. Churchill* (1890, 1895), Hermit Lake, *E. & C. E. Faxon* (1888, 1895), *P.* 10736 (1907); alpine region, *Oakes* (no date).

Carex lenticularis Michx., var. **albi-montana** Dewey. Chiefly

on the headwalls of ravines on Mt. Washington, local.—Carroll, Crawford's, *E. & C. E. Faxon* (1878), *J. R. Churchill* (1895); Sargent Purchase, Huntington Ravine, *F. & P.* 15515 (1917), Tuckerman Ravine, *C. G. Pringle* (1877), *E. & C. E. Faxon* (1890), *J. R. Churchill* (1895), *P.* 11501 (1908), *F. F. Forbes* (1914); 'margin of pond in the White Mts.,' *W. Boott* (1859).

Carex lenticularis Michx., var. **Blakei** Dewey. Meadows, infrequent.—Pittsburg, First Lake, *P.* 10282 = *M.* 3577 (1907); Stewartstown, *P.* 10203 = *M.* 3402 (1907); Randolph, near Gordon Fall, *P.* 4055 (1904); Carroll, Crawford's, *E. & C. E. Faxon* (1878).

Carex stricta Lam. Meadows, occasional.—Pittsburg, Second Lake, *P.* 10273 (1907), west of Indian Stream, *P.* 10976 (1907); Dartmouth College Grant, *P.* 16200 (1914); Lancaster, *P.* 16383 (1915); Randolph, *P.* 16423 (1917); Shelburne, *Deane* (1915); Carroll, Crawford's, *Williams* (1895).

Carex stricta Lam., var. **curtissima** Peck. Infrequent.—Northumberland, *F. & P.* 16694 (1917); Shelburne, *Deane* (1883).

Carex stricta Lam., var. **angustata** (Boott) Bailey. Rare.—Lancaster, *P.* 17805 (1920).

Carex stricta Lam., var. **decora** Bailey. Meadows, rather frequent.—Pittsburg, River Road, *P.* 10083 = *M.* 3683 (1907); Stratford, *P.* 13457, 13495 (1912); (Northumberland); Randolph, *P.* 16349 (1915), 17410 (1919); Shelburne, *Deane* (1916); Carroll, near Fabyans, *E. & C. E. Faxon* (1879), *P.* 16657, 16691 (1916); Thompson & Meserve Purchase, Madison Ravine, *P.* 16482 (1915).

Carex pauciflora Lightf. Bogs, locally abundant.—Dartmouth College Grant, *P.* 16286 (1914); Northumberland, near lower Jonathan Pond, *P.* 13452 (1912); Lancaster, bog north of Fair Ground, *P.* 17174 (1918), north of Coös Junction, *P.* 12158 (1909); Whitefield, between Weed and Tosney Ponds, *P.* 14413 (1913); Jefferson, near Cherry Pond, *P.* 10800 (1907); Shelburne, Dream Lake, *P.* 19213 (1923).

Carex leptalea Wahlenberg. Meadows and boggy pastures, common.—Pittsburg, First Lake, *P.* 10291 = *M.* 3586 (1907);

Clarksville, *F. & P.* 17049 (1917); (Stewartstown); (Colebrook); (Columbia); Stratford, *P.* 13589 (1912); Northumberland, *P.* 16459 (1917); Success, *P.* 16536 (1917); Dalton, *P.* 16393 (1915); Whitefield, *Deane* (1896); Randolph, *M.* 3286, 3292 (1907), *P.* 10055 (1907); Shelburne, *Deane* (1915); Low & Burbank Grant, Valleyway, 3000 ft., *P.* 14162 (1913); Martin Location, *P.* 14343 (1913); Green Grant, *P.* 17106 (1918).

Carex atratiformis Britton (*C. atrata* L., var. *ovata* (Rudge) Boott). Meadow at head of Oakes Gulf, very local.—Cutts Grant, Oakes Gulf, *W. Oakes* (no date), *W. Boott* (1857, 1861), *E. & C. E. Faxon* (1877, 1878, 1879, 1886, 1888, 1895), *Williams* (1893, 1895), *J. R. Churchill* (1895), *W. W. Eggleston* (1899), *P.* 12026 (1909).

Carex polygama Schkuhr. Rare.—Columbia, Lime Pond, *P.* 10460 = *M.* 3861 (1907).

Carex gracillima Schwein. Meadows and roadsides, frequent.—Pittsburg, First Lake, *P.* 10278 (1907); Atkinson & Gilmanton Academy Grant, Hellgate, *P.* 12588 (1910); Jefferson, *P.* 18078 (1921); Randolph, *P.* 12672 (1910), 16350 (1915); Shelburne, *Deane* (1916, 1917); Thompson & Meserve Purchase, Base Station, *E. & C. E. Faxon* (1878).

Carex gracillima Schwein., var. **humilis** Bailey. Local.—Stewartstown, Buck Pond, *F. & P.* 16778 (1917); Colebrook, *F. & P.* 16684 (1917).

Carex scirpoidea Michx. Gravelly soil, chiefly alpine, local.—Carroll, railroad track north of Crawford's, *P.* 16664 (1916); Bean Grant, Mt. Webster, *P.* 11723 (1908); Sargent Purchase, Mt. Washington, *W. Boott* (1865), Alpine Garden, *J. R. Churchill, Williams* (1895), *P.* 10588 (1907), Huntington Ravine, *F. & P.* 16757 (1917); alpine region, not definitely located, *Oakes* (no date), *Tuckerman* (no date).

Carex umbellata Schkuhr. Dry open soil, occasional.—Colebrook, *P.* 11076 = *M.* 3795 (1907); Northumberland, *P.* 13497 (1912); Whitefield, *P.* 16681 (1916); Randolph, *P.* 10039, 10046 (1907); Carroll, Crawford's, *P.* 16667 (1916).

Carex umbellata Schkuhr, var. **brevirostris** Boott. Infrequent.—Randolph, *P.* 10702 = *M.* 3379 (1907), *P.* 17802 (1920).

Carex deflexa Hornem. Woods, not infrequent; also one alpine locality.—Stratford, *P.* 13620 (1912); Carroll, Crawford's, *C. E. Faxon* (1878); Randolph, *P.* 6399 (1904), 10014 = *M.* 3281, *P.* 1009 = *M.* 3269, *P.* 10033 = *M.* 3315 (1907), *P.* 14118 (1913); Sargent Purchase, Alpine Garden, *E. & C. E. Faxon* (1896), *E. Faxon* (no date), Huntington Ravine, *F. & P.* 16851 (1917); Bean Purchase, North Baldface Mt., *P.* 16038 (1914).

Carex albicans Willd. Rich woods, somewhat local.—Colebrook, Lombard Hill, *F. & P.* 16623 (1917); Jefferson Highlands, *P.* 16717 (1916); Carroll, near Bretton Woods, *P.* 16690 (1916); Randolph, Torrey Path, 10699 (1907), 16009 (1914); Shelburne, Moses' Rock, *Deane* (1919), Leighton woods, *Deane* (1922).

Carex communis Bailey. Gravelly banks, common.—Pittsburg, First Lake, *P.* 10133 = *M.* 3664 (1907); Dartmouth College Grant, *P.* 16253 (1914); Stewartstown, *P.* 10205 = *M.* 3385 (1907), *F. & P.* 16785 (1917); Stratford, *P.* 13494, 13596, 13617, 13622 (1912); (Stark); (Northumberland); Milan, *P.* 17118 (1918); (Success); (Lancaster); Dalton, *P.* 12291 (1909); Jefferson, *P.* 16503 (1917); Randolph, *J. R. Churchill* (1889), *P.* 10007 = *M.* 3303 (1907), *P.* 10044, 10699 (1907), 12750 (1910); Shelburne, *Deane* (1904, 1910, 1914); Carroll, Bretton Woods, *P.* 11264 (1908), 16688 (1916), Crawford's, *E. & C. E. Faxon* (no date), *Williams* (1898); (Low & Burbank Grant).

Carex novae-angliae Schwein. Shaded banks, common.—Pittsburg, near Third Lake, *P.* 10336 = *M.* 3517 (1907), west of Indian Stream, *P.* 10950 = *M.* 3736, *P.* 10990 = *M.* 3753 (1907); Dartmouth College Grant, *P.* 16243 (1914); Stewartstown, *P.* 10208 = *M.* 3386, *P.* 10149 = *M.* 3691, *P.* 10147 = *M.* 3686 (1907); Colebrook, *F. & P.* 16565 (1917); Columbia, *F. & P.* 16791 (1917); Stratford, *P.* 13616, 13619 (1912); Dummer, *P.* 12659 (1910); Success, *P.* 10646 (1907); Berlin, *P.* 16124 (1914); Jefferson, *P.* 16372 (1915), 16506 (1917); Randolph, *Williams* (1897), *P.* 10011 = *M.* 3282, *P.* 10006 = *M.* 3268, *P.* 10041, 10693 (1907); Carroll, Crawford's, *E. & C. E. Faxon* (1893); Thompson & Meserve Purchase, near Base Station (1891); Bean Grant, *Williams* (1895); (Bean Purchase).

Carex pennsylvanica Lam. Dry open places, chiefly along railroads, not very abundant.—Jefferson, *P.* 16370 (1915); Randolph, *P.* 16357 (1915); Shelburne, *Deane* (1918).

Carex pennsylvanica Lam., var. **lucorum** (Willd.) Fern. Richer soil, frequent.—Stratford, *P.* 13493 (1912); Whitefield, *P.* 16680 (1916); Dalton, *P.* 16092 (1914); Jefferson, *P.* 18072 (1921); Shelburne, *Deane* (1919).

Carex pallescens L. Meadows, very common.—Pittsburg, near Third Lake, *P.* 10339 = *M.* 3516 (1907); (Stewartstown); (Columbia); (Millsfield); Stratford, *P.* 13618 (1912); (Northumberland); Milan, *P.* 13819 (1912); (Success); (Dalton); Whitefield, *Deane* (1896), *M.* 5005 (1913); Jefferson, *P.* 16511 (1917); Randolph, *Williams* (1894), *P.* 10018 = *M.* 3283, 3317 (1907); (Gorham); Shelburne, *Deane* (1883, 1911, 1913, 1914); (Carroll).

Carex paupercula Michx. (including vars. *irrigua* (Wahlenb.) Fern. and *pallens* Fern.; *cf. Rhod.* 23 (1921), 96). Bogs, frequent.—Pittsburg, Second Lake, *P.* 10265 = *M.* 3447 (1907); Stewartstown, Buck Pond, *F. & P.* 16770 (1917); Stark, *P.* 14143 (1913); Northumberland, Groveton, *P.* 17152 (1918); Lancaster, Coös Junction, *P.* 12165 (1909); Jefferson, Jefferson Junction, *P.* 12782 (1910); Randolph, *P.* 17333 (1918); Low & Burbank Grant, Jefferson Notch, *P.* 11276 (1908); Sargent Purchase, Mt. Washington, *W. F. Flint & J. H. Huntington* (1876), Hermit Lake, *W. Boott* (1855), *E. & C. E. Faxon* (1879), *J. R. Churchill* (1889, 1890), *G. G. Kennedy* (1891), *J. R. Churchill* (1895), *P.* 1545 (1902), Gulf of Slides, *M.* 1420 (1903), Lakes of the Clouds, *W. Boott* (1861), *E. & C. E. Faxon* (1889), Ammonoosuc Ravine, *P.* 16762 (1916); Bean Grant, Mt. Clinton, *E. & C. E. Faxon* (1880, 1895), *Williams* (1895); Presidential Range, not definitely located, *Oakes* (no date), *Tuckerman* (no date), *H. Mann* (1862); Bean Purchase, Mt. Lethe, *P.* 10939 (1907).

Carex limosa L. Bogs and margins of ponds, local.—Stewartstown, Buck Pond, *F. & P.* 16777 (1917); Lancaster, bog north of Fair Ground, *P.* 17172 (1918), Baker Pond, *P.* 17278 (1918), 17804 (1920); Jefferson, Cherry Pond, *P.* 10574 (1907).

Carex pedunculata Muhl. Rich, especially rocky, woods, frequent.—(Colebrook); (Columbia); Stratford, *P.* 13615 (1912);

Berlin, *P.* 16114 (1914); Lancaster, Mt. Tug, *P.* 16095 (1914); Whitefield, *P.* 16672 (1916); Dalton, *P.* 16091 (1914), 16391 (1915); Randolph, *P.* 16008 (1914), 16432 (1917).

Carex plantaginea Lam. Rich woods, not infrequent, especially northward.—Colebrook Academy Grant, *P.* 14156 (1913); Dixville, *P.* 10562 (1907); Stewartstown, *P.* 14059 (1912); Colebrook, *P.* 10436 = *M.* 3826 (1907); Columbia, *P.* 14069 (1912); Stratford, *P.* 13612 (1912), Sugarloaf Mt., *P.* 13558 (1912); Stark, *P.* 17436 (1919); Lancaster, near Coös Junction, *P.* 16397 (1915); Dalton, *P.* 17407 (1919); Carroll, *P.* 17431 (1919); Randolph, *P.* 219 (1901), *M.* 1102 (1903), *P.* 11193 (1908).

Carex platyphylla Carey. Rich wooded hillsides, very local.—Lancaster, Mt. Tug, *P.* 16734 (1916), Mt. Prospect, *P.* 16915 (1917), 17229 (1918).

Carex anceps Muhl. (*C. laxiflora* Lam., var. *patulifolia* (Dewey) Carey; *cf. Rhod.* 24 (1922), 99). Rocky woods, local.—Lancaster, Mt. Tug, *P.* 16757 (1916); Shelburne, base of Crag, *Deane* (1916, 1917, 1919).

Carex blanda Dewey (*C. laxiflora* Lam., var. *blanda* (Dewey) Boott; *cf. Rhod.* 24 (1922), 194). Infrequent.—Jefferson, *P.* 16351 (1915); Carroll, Twin Mountain, *P.* 16702 (1916); Thompson & Meserve Purchase, near Base Station, *E. & C. E. Faxon* (1888); Sargent Purchase, summit of Mt. Washington, *J. R. Churchill* (1890); Shelburne, *Deane* (1915, 1916).

Carex ormostachya Wiegand (*C. laxiflora* Lam., in part; *cf. Rhod.* 24 (1922), 196). Woods and banks, occasional.—Berlin, Mt. Forist, *P.* 16125 (1914); Gorham, *P.* 12210 (1909); Shelburne, *Deane* (1914, 1915, 1917).

Carex leptonervia Fern. (*C. laxiflora* Lam., var. *leptonervia* Fern.; *cf. Rhod.* 16 (1914), 214).—Pittsburg, Third Lake, *M.* 3475 (1907), First Lake, *P.* 10093 = *M.* 3648 (1907); Dartmouth College Grant, *P.* 16252 (1914); Stewartstown, *M.* 3393 (1907), *F. & P.* 16813 (1917); Colebrook, *P.* 11079 = *M.* 3825 (1907); (Success); Randolph, *P.* 10022 = *M.* 3284, 3287 (1907); Martin Location, *P.* 14268 (1913); Low & Burbank Grant, *P.* 10229 (1907); Thompson & Meserve Purchase, Mt. Washington Railroad, 3500 ft., *E. & C. E. Faxon* (1888); Sargent Purchase,

Tuckerman Ravine, *E. & C. E. Faxon* (1888); Cutts Grant, Oakes Gulf, *E. & C. E. Faxon* (1889), *Williams* (1907), *M.* 4547 (1909); Shelburne, *Deane* (1915, 1916, 1917, 1919).

Carex conoidea Schk. Damp pastures, very local.—Columbia, *F. & P.* 16708 (1917); Lancaster, Mt. Prospect, *P.* 14178 (1913).

Carex flava L. Boggy pastures and pond shores, chiefly in the Connecticut valley and most abundant in calcareous districts.—Clarksville, *P.* 10954 = *M.* 3710 (1907); Stewartstown, Ladd Pond, *P.* 10401 = *M.* 3965 (1907); Colebrook, *P.* 10425 = *M.* 3806, *P.* 10934 = *M.* 3993 (1907); Columbia, *F. & P.* 16696 (1917), Lime Pond, *P.* 10469 = *M.* 3866 (1907); Stark, *P.* 12728 (1910); Northumberland, *P.* 16093 (1914); Milan, *P.* 13748 (1912); Berlin, Dead River, *P.* 14506 (1913); Lancaster, Mt. Prospect, *P.* 14177 (1913), Clark Pond, *P.* 12280 (1909); Whitefield, near Burns Pond, *P.* 16685 (1916); Thompson & Meserve Purchase, Base Station, *P.* 16778 (1916).

Carex cryptolepis Mackenzie (*C. flava* L., var. *rectirostra* of *Manual; cf. Rhod.* 23 (1921), 237). Boggy pastures and pond shores, occasional.—Stewartstown, *P.* 10080 = *M.* 3693 (1907), Ladd Pond, *F. & P.* 17052 (1917); Cambridge, Lake Umbagog, *P.* 18178 (1921); Milan, *P.* 13801 (1912); Berlin, Dead River, *P.* 14481 (1913); Whitefield, *P.* 14577 (1913).

Carex Oederi Retz. Boggy shores, infrequent.—Colebrook, *F. & P.* 16686 (1917); Columbia, Lime Pond, *P.* 10470 = *M.* 3856 (1907); Berlin, Dead River, *P.* 14487 (1913), 17845 (1920).

Carex longirostris Torr. Rocky woods, very local.—Lancaster, summit of Mt. Prospect, *P.* 14174 (1913); Shelburne, grassy border of woods near river, *Deane* (1915, 1916).

Carex capillaris L. Eastern alpine slope of Mt. Washington, local.—Sargent Purchase, Mt. Washington, *W. Boott* (1865), *E. & C. E. Faxon* (1879), Alpine Garden, *C. G. Pringle* (1877), *E. & C. E. Faxon* (1877, 1878, 1887, 1895), *Williams* (1893, 1895, 1901), *J. R. Churchill* (1895), *W. W. Eggleston* (1899), *P.* 10599 (1907); alpine region, not definitely located, *Oakes* (no date), *Robbins* (no date).

Carex arctata Boott. Moist woods, common.—Pittsburg, *M.* 3476 (1907); Stewartstown, *M.* 3392 (1907); (Success); Whitefield, *Deane* (1896); Randolph, *Williams* (1897), *P.* 10057 = *M.* 3318 (1907); Shelburne, *Deane* (1909, 1917); Carroll, Bretton Woods, *P.* 16663 (1916), Crawford's, *W. Boott* (1865), *C. E. Faxon* (1878), *E. & C. E. Faxon* (1887); Thompson & Meserve Purchase, Base Station, *E. & C. E. Faxon* (1888); Sargent Purchase, Raymond Path, *E. & C. E. Faxon* (1888); Bean Grant, Mt. Clinton, *Williams* (1895); Martin Location, *P.* 14279 (1913).

Carex debilis Michx., var. **Rudgei** Bailey. Open woods and meadows, common.—Pittsburg, First Lake, *P.* 10140 = *M.* 3644 (1907); Dartmouth College Grant, *P.* 16163 (1914); Dixville, *Deane* (1917); (Stewartstown); Stratford, *P.* 13537 (1912); Milan. *P.* 13820 (1912); (Success); Whitefield, *Deane* (1896); Jefferson, *P.* 16521 (1917); Randolph, *Williams* (1897), *P.* 1772 (1901), 6405 (1904), 10038 (1907), *M.* 3284A (1907); Shelburne, *Deane* (1913); Carroll, near Fabyans, *J. R. Churchill* (1895), Crawford's, *E. Faxon* (1887); Thompson & Meserve Purchase, Mt. Washington, 3700, 4800, 5200 ft., *E. & C. E. Faxon* (1887); Bean Grant, Mt. Jackson, *H. St. John* (1912); Mt. Washington, not definitely located, *Tuckerman* (no date).

Carex debilis Michx., var. **strictior** Bailey. Moist alpine or subalpine localities, occasional.—Low & Burbank Grant, Air Line, *P.* 12097 (1909); Thompson & Meserve Purchase, Mt. Washington Railroad, first tank from the bottom, type station, *Williams* (1895, 1896), 3700 ft., *E. & C. E. Faxon* (1887), 3500 ft., *E. & C. E. Faxon* (1888); Sargent Purchase, Huntington Ravine, Fan, *F. & P.* 16753 (1917); Bean Purchase, Carter Notch, 3200 ft., *E. & C. E. Faxon* (1890); Mt. Washington, not definitely located, *E. & C. E. Faxon* (1895).

Carex scabrata Schwein. Wet places, especially in woods, common.—Clarksville, *P.* 10952 = *M.* 3710 (1907); Dixville Notch, *W. W. Eggleston* (1899); (Stewartstown); (Colebrook); Stratford, *P.* 13609 (1912); (Success); Randolph, *Williams* (1893, 1894), *P.* 1541 (1901), *M.* 1931 (1904), *P.* 9906 (1907); (Gorham); Shelburne, *Deane* (1883, 1911, 1914); Carroll, Fabyans, *E. & C. E. Faxon* (1878), Crawford's, *E. & C. E. Faxon* (1878); (Low & Burbank Grant); (Sargent Purchase); Bean Grant, Mt. Clin-

ton, *Williams* (1895); Martin Location, *P.* 14285 (1913); Pinkham Grant, *Deane* (1909).

Carex lasiocarpa Ehrh. (*C. filiformis* L.). Margins of ponds and in wet meadows, Connecticut valley, frequent.—Pittsburg, west of Indian Stream, *P.* 10991 (1907); Clarksville, Clarksville Pond, *P.* 10955 = *M.* 3707 (1907); Stewartstown, Ladd Pond, *P.* 10399 = *M.* 3956 (1907); Columbia, Lime Pond, *P.* 10445 = *M.* 3852 (1907); Lancaster, Martin Meadow Pond, *P.* 17587 (1919); Whitefield, Weed Pond, *P.* 14465 (1913); Jefferson, Cherry Pond, *P.* 10579 (1907).

Carex Houghtonii Torr. Sandy soil, very local.—Carroll, railroad track near Quebec Junction, *P.* 12702 (1910).

Carex oligosperma Michx. Bogs and shores of ponds, frequent.—Dartmouth College Grant, *P.* 16285 (1914); Stark, near Pike Pond, *P.* 14142 (1913); Berlin, Head Pond, *P.* 14484 (1913); Lancaster, near Mountorne station, *P.* 12283 (1909); Dalton, near Boston & Maine station, *P.* 12376 (1909); Jefferson, Cherry Pond, *P.* 10575 (1907), 11465 (1908); Carroll, Crawford's, *Williams* (1895).

Carex Pseudo-Cyperus L. Margins of ponds, local.—Columbia, Fish Pond, *P.* 13973 (1912); Dalton, Forest Lake, *P.* 14563 = *M.* 5012 (1913).

Carex hystericina Muhl. Swales, not common.—Colebrook, *P.* 10426 = *M.* 3805 (1907), *F. & P.* 16681 (1917); (Columbia); Dalton, *P.* 16416 (1915); (Jefferson).

Carex lurida Wahlenberg. Low ground, common.—Pittsburg, near Canaan line, *P.* 10947 (1907); Colebrook, *P.* 10933 = *M.* 3997 (1907); (Northumberland); Milan, *P.* 13743 (1912); Whitefield, *Deane* (1895, 1897); Dalton, *P.* 17390 (1919); Jefferson, *P.* 16518, 16704 (1917); Carroll, *P.* 14305 (1913); Randolph, *Williams* (1894, 1895, 1896, 1897), *P.* 1737 (1901), 1766 (1902), *M.* 1018, 1092, 1445 (1903), *P.* 4072 (1904), 16912 (1917); Gorham, *P.* 17392 (1919); Shelburne, *Deane* (1883, 1885, 1914); Martin Location, *P.* 14305 (1913).

Carex retrorsa Schwein. Wet places, frequent.—Pittsburg, First Lake, *P.* 10165, 10127 = *M.* 3596, 3547 (1907); Colebrook,

P. 14072 (1912); Cambridge, *Williams* (1906); Milan, *P.* 13695 (1912); Lancaster, *P.* 14538 (1913); Carroll, Bretton Woods, *Tuckerman* (no date).

Carex lupulina Muhl. Low ground, infrequent.—Stratford, *P.* 17706 (1919); Dalton, *P.* 11603 = *M.* 4372 (1908); Shelburne, *Deane* (1883, 1885), *P.* 11320 = *M.* 4143 (1908).

Carex intumescens Rudge (including var. *Fernaldii* Bailey). Swamps and damp woods, common.—Pittsburg, Second Lake, *P.* 10263 = *M.* 3424 (1907), First Lake, *P.* 10197 = *M.* 3539 (1907); Dartmouth College Grant, *P.* 16250 (1914); Colebrook, *F. & P.* 16683, 16690 (1917); Columbia, *M.* 3383 (1907); (Millsfield); Errol, *F. & P.* 16980 (1917); Cambridge, Lake Umbagog, *Deane* (1916); Stratford, *P.* 13465, 13506 (1912); (Milan); (Success); Whitefield, *Deane* (1896); Jefferson, *P.* 16514 (1917); Randolph, *Williams* (1895), *P.* 1542, 1701 (1901), *M.* 1446 (1903), *P.* 6400 (1904), 10040 (1907); Shelburne, *Deane* (1883, 1914); Carroll, Crawford's, *Williams* (1895); Crawford Purchase, *P.* 11251 (1908); (Low & Burbank Grant); (Thompson & Meserve Purchase); Bean Grant, *H. St. John* (1912); Martin Location, *P.* 14283 (1913).

Carex Michauxiana Boeckl. Bogs and borders of ponds and slow streams, local.—Milan, Goose Pond, *P.* 19173, 19198 (1923); Berlin, Dead River, abundant, *P.* 16513 (1915); Randolph, Pond of Safety, *P.* 12687 (1910); Shelburne, Moose Pond, *Deane* (1917), Dream Lake, *P.* 19209 (1923); Carroll, Crawford's, *E. & C. E. Faxon* (1878, 1889), *E. Faxon* (1879), *J. R. Churchill* (1895), *Williams* (1895, 1898); Pinkham Grant, Dismal Pool, *W. Boott* (1855), *J. A. Allen* (1878, 1880), *P.* 13892 (1912).

Carex vesicaria L. Low ground, occasional.—Atkinson & Gilmanton Academy Grant, Hellgate, *P.* 12597 (1910); Milan, Cedar Pond, *P.* 17444 (1919); Shelburne, *Deane* (1913).

Carex vesicaria L., var. **jejuna** Fern. Similar localities, common.—Pittsburg, Second Lake, *P.* 10268 = *M.* 3450 (1907), First Lake, *Mrs. A. F. Stevens* (1895), *P.* 10281 = *M.* 3578 (1907); (Colebrook); Dummer, *P.* 12665 (1910); (Northumberland); Jefferson, *P.* 16524 (1917); Randolph, *P.* 1733, 1741 (1901), *M.* 1004 (1903), *P.* 10023 = *M.* 3290 (1907), *M.* 4216 (1908); Shel-

burne, *Deane* (1915); Bean Purchase, Carter Notch, *P.* 6408 (1904).

Carex vesicaria L., var. **monile** (Tuckerm.) Fern. Infrequent.—Randolph, *Williams* (1894); Shelburne, *Deane* (1883).

Carex rostrata Stokes. Swamps and shallow water, occasional.—Stewartstown, *F.* & *P.* 16827 (1917); Columbia, Fish Pond, *P.* 13967 (1912); Stark, Percy, *P.* 14138 (1913); Whitefield, *Deane* (1896), Weed Pond, *P.* 14464 (1913); Carroll, Crawford's, *C. E. Faxon* (1878), *Williams* (1895); Pinkham Grant, Dismal Pool, *P.* 13904 (1912).

Carex rostrata Stokes, var. **utriculata** (Boott) Bailey. Similar localities, occasional.—Pittsburg, Second Lake, *P.* 10254 = *M.* 3415, *P.* 10267 = *M.* 3448 (1907), First Lake, *P.* 10196 = *M.* 3544 (1907); Lancaster, *P.* 16382 (1915); Jefferson, Cherry Pond, *P.* 10530 (1907); Randolph, near Pond of Safety, *P.* 12225 (1903); Gorham, *P.* 17402 (1919).

Carex Tuckermani Dewey. Damp alluvial woods, infrequent.—Pittsburg, near Indian Stream, *P.* 10984 = *M.* 3729 (1907); Errol, near junction of Androscoggin River and Clear Stream, *F.* & *P.* 16979 (1917); Stratford, *P.* 17658 (1919).

ARACEAE (ARUM FAMILY).

ARISAEMA Martius. Indian Turnip.

Arisaema triphyllum (L.) Schott. Jack-in-the-Pulpit. Damp woods, common.—Pittsburg, First Lake, *Mrs. A. F. Stevens* (1895), near Canaan line, *M.* 3748 (1907); (Stewartstown); Colebrook, *P.* 10823 = *M.* 3809 (1907); (Columbia); (Millsfield); Stratford, *P.* 13675 (1912); (Stark); (Northumberland); (Lancaster); (Dalton); (Jefferson); (Carroll); Randolph. *Williams* (1895), *M.* 981 (1903), 3264 (1907), 11348 (1908); Gorham, *W. C. Cusick* (1887); Shelburne, *Deane* (1915).

CALLA L. Water Arum.

Calla palustris L. Cold bogs and margins of ponds, frequent.—Pittsburg, Mud Pond, *W. C. Kendall, E. L. Goldsborough,* & *A. Doolittle* (1904); (Stewartstown); (Columbia); Stratford, *P.* 13644 (1912); Northumberland, *P.* 17201 (1918); Lancaster, *P.*

12325 (1909); Dalton, *P.* 12347 (1909); Whitefield, Weed Pond, *P.* 14445 (1913); Jefferson, Cherry Pond, *P.* 11007 (1907); Randolph, Pond of Safety, *Williams* (1893), *M.* 1131 (1903), *P.* 10454 = *M.* 3308 (1907); Gorham, Mascot Pond, *Williams* (1895); Shelburne, *C. E. Faxon* (1886, 1889), Wheeler's Bog, *Deane* (1882, 1883, 1884, 1914).

SYMPLOCARPUS Salisb. Skunk Cabbage.

Symplocarpus foetidus (L.) Nutt. Very local.—Pittsburg, east of Pittsburg village, in a cedar bog, *P.* 14155 (1913).

ACORUS L. Sweet Flag.

Acorus Calamus L. Boggy meadows, frequently introduced and spreading.—Pittsburg, First Lake, *P.* 10862 = *M.* 3551 (1907); (Colebrook); Stratford, *P.* 17704 (1919); (Milan); Lancaster, *P.* 12334 (1909); (Dalton); Whitefield, *P.* 14319 (1913); (Jefferson); Randolph, *Williams* (1896), *P.* 12797 (1910); Shelburne, *Deane* (1883, 1916); Martin Location, *P.* 14333 (1913).

LEMNACEAE (DUCKWEED FAMILY).

SPIRODELA Schleid.

Spirodela polyrhiza (L.) Schleid. Shallow pools, rare.—Lancaster, pool north of Fair Ground, *P.* 17155 (1918); Dalton, Scott Junction, *P.* 12378 (1909).

ERIOCAULACEAE (PIPEWORT FAMILY).

ERIOCAULON [Gronov.] L. Pipewort.

Eriocaulon septangulare With. (*E. articulatum* Morong, in part; *cf. Rhod.* 11 (1909), 40). Borders of ponds in shallow water or on damp sand or mud, frequent.—Pittsburg, Round Pond, First Lake, *W. C. Kendall, E. L. Goldsborough, & A. Doolittle* (1904); Cambridge, Lake Umbagog, *P.* 17514 (1919), 18182 (1921); (Stark); Milan, Nay Pond, *P.* 13875 (1912); (Success); Berlin, York Pond, *P.* 17166 (1918); Lancaster, Martin Meadow Pond, *P.* 16656 (1917); Dalton, Forest Lake, *P.* 16872 (1919); Whitefield, Burns Pond, *P.* 17790 (1919); Jefferson, Cherry Pond, *P.* 10661 (1907); Randolph, Pond of Safety, *M.* 1138 (1903), *P.* 5412 (1904); (Gorham); Carroll, Crawford's, *Miss S. Minns* (1887), Ammonoosuc Lake, *Williams* (1895).

XYRIDACEAE (YELLOW-EYED GRASS FAMILY).

XYRIS [Gronov.] L. Yellow-eyed Grass.

Xyris montana Ries. Peat-bogs, very local.—Milan, Goose Pond, *P.* 19176, 19203 (1923).

PONTEDERIACEAE (PICKEREL-WEED FAMILY).

PONTEDERIA L. Pickerel-weed.

Pontederia cordata L. Shallow water, local.—(Errol); (Dummer); Northumberland, Horseshoe Pond, *P.* 17309 (1918); Lancaster, Baker Pond, *P.* 17264 (1918); Jefferson, Cherry Pond, *P.* 11093(1907).

JUNCACEAE (RUSH FAMILY).

JUNCUS [Tourn.] L. Rush.

Juncus bufonius L. Roadsides and low ground, common.—(Pittsburg); Colebrook, *P.* 10392 = *M.* 3938 (1907); (Columbia); (Errol); Milan, *P.* 13706 (1912); (Berlin); Whitefield, *Deane* (1897), *M.* 4409 (1908); (Jefferson); Randolph, *Williams* (1894), *M.* 1095 (1903), *P.* 4174 (1904), *M.* 3200 (1906), *P.* 10891 (1907); Gorham, *M.* 4224 (1908), *P.* 17391 (1919); Martin Location, *P.* 14351 (1913); Shelburne, *Deane* (1917, 1919); Carroll, Bretton Woods, *E. & C. E. Faxon* (1889).

Juncus bufonius L., var. **congestus** Wahlb. Rare.—Randolph, roadside near town hall, *P.* 282½ (1902).

Juncus trifidus L. Mountain tops, common; very rarely at lower levels.—Dixville Notch, 1990 ft., *Deane* (1917); Stratford, Percy Peaks, *P.* 12733 (1910); Success, Mt. Success, *P.* 11164 = *M.* 4127 (1908); Randolph, one plant near Appalachia station, *P.* 17606 (1919); Low & Burbank Grant, Madison Hut, *M.* 1098 (1903), King Ravine, *P.* 4081 (1904), Spur Trail, *M.* 3206 (1906); Thompson & Meserve Purchase, *P.* 12306 (1909), Mt. Madison, *R. A. Ware* (1902), Star Lake, *Williams* (1893), Mt. J. Q. Adams, *P.* 10878 (1907), Mt. Washington Carriage Road, *Deane* (1884); Sargent Purchase, Mt. Washington, *F. Boott* (1816), *W. F. Flint & J. H. Huntington* (1876), *J. A. Allen* (1878), *Miss S. Minns* (1884), *Williams* (1893), *E. D. Merrill* (1896), *J. Robinson* (1901), Huntington Ravine, *E. & C. E. Faxon* (1878), Tuckerman Ravine, *M.* 250 (1902), Crawford Trail, *Williams*

(1893); Bean Grant, Mt. Clinton, *W. P. Rich* (1880), Mt. Webster, *P.* 11721 (1908); Hadley Grant, Mt. Crawford, *P.* 11705 (1908); alpine region, not definitely located, *Oakes* (no date), *J. Carey* (no date), *W. Boott* (1853), *H. Mann* (1862).

Juncus trifidus L., var. **monanthos** (Jacq.) Bluff & Fingerhuth. Rather infrequent, below tree-line.—Dixville, Table Rock, *P.* 10626 (1907); Low & Burbank Grant, Valleyway, *P.* 12777 (1910); Thompson & Meserve Purchase, Six Husbands Trail, *P.* 12250 (1909); Sargent Purchase, Mt. Pleasant, *P.* 16774 (1916).

Juncus tenuis Willd. Fields and roadsides, common.—(Pittsburg); Dartmouth College Grant, *P.* 16168 (1914); Stewartstown, *P.* 17676 (1919); (Colebrook); (Columbia); (Stark); Milan, *P.* 13700, 13715 (1912); (Success); (Berlin); (Dalton); (Jefferson); Randolph, *M.* 1096 (1903), *P.* 2507 (1903), 4018, 4126 (1904), 9870, 9871 (1906), *M.* 3202 (1906), *P.* 11775 (1908), 12749 (1910), 17726 (1919); Shelburne, *Deane* (1913, 1916); (Carroll); Low & Burbank Grant, *P.* 10659 (1907); (Thompson & Meserve Purchase); Martin Location, *P.* 14341 (1913); (Pinkham Grant); Bean Purchase, Carter Notch, *P.* 4060, 6412, 6413 (1904).

Juncus tenuis Willd., var. **Williamsii** Fern. Occasional.—Stewartstown, *F. & P.* 16675 (1917); Lancaster, *F. & P.* 16640 (1917).

Juncus Dudleyi Wieg. Damp soil, frequent in the calcareous area.—Stewartstown, Ladd Pond, *P.* 10400 = *M.* 3967 (1907), *P.* 13932 (1912); Colebrook, *P.* 12587 (1910); Columbia, Lime Pond, *P.* 10461 = *M.* 3849 (1907), Fish Pond, *F. & P.* 16736 (1917).

Juncus Greenei Oakes & Tuckerman. Dry soil, common southward.—Wentworth Location, *P.* 12652 (1910); Milan, *P.* 10537 (1907); Success, *P.* 11763 = *M.* 4315 (1908); Jefferson, *P.* 10651 (1907); Randolph, *P.* 5754 (1904), *M.* 1934 (1904), 3199 (1906); Gorham, *P.* 10860 (1907); Shelburne, *Deane* (1883, 1913), *P.* 288 (1901); Martin Location, *P.* 14250 (1913); Green Grant, *P.* 5751, 5752 (1904), 13917 (1912); Bean Purchase, Carter Notch, *P.* 6394, 6395 (1904); Thompson & Meserve Purchase, Carriage Road, 3800 ft., *P.* 4050 (1904), 3500 ft., *F. & P.* 16872 (1917).

Juncus filiformis L. Bogs and wet shores, common.—Pittsburg, First Lake, *P.* 10135, 10284 = *M.* 3576, 3665 (1907); Dixville Notch, *Deane* (1917); Colebrook, *M.* 3988 (1907); (Columbia); (Cambridge); (Stratford); (Northumberland); (Milan); (Success); Jefferson, *P.* 16516 (1917); Randolph, *Williams* (1894), *P.* 5740 (1904), *M.* 4218 (1908); (Gorham); Shelburne, *Deane* (1915); Thompson & Meserve Purchase, *P.* 9895 (1906), 10596 (1907), Base Station, *E.* & *C. E. Faxon* (1878), Cape Horn, *Williams* (1896); Sargent Purchase, Alpine Garden, *Williams* (1893, 1896), *E.* & *C. E. Faxon* (1896), Gulf of Slides, *M.* 1419 (1903); Mt. Washington, not definitely located, *W. Boott* (1853), *J. A. Allen* (1878).

Juncus effusus L., var. **decipiens** Buchenau (*Rhod.* 12 (1910), 87). Occasional.—Stewartstown, *F.* & *P.* 16783 (1917); Colebrook, *F.* & *P.* 16682 (1917); Northumberland, *F.* & *P.* 16814 (1917); Randolph, *F.* & *P.* 16874 (1917); Gorham, *F.* & *P.* 16873 (1917); Sargent Purchase, Carriage Road, *F.* & *P.* 16864 (1917).

Juncus effusus L., var. **Pylaei** (LaHarpe) Fern. & Wieg. (*Rhod.* 12 (1910), 92). The commonest form of this species in our area.—Colebrook, *M.* 3909 (1907), *F.* & *P.* 16821 (1917); Dummer, *P.* 16542 (1917); Stark, *P.* 12770 (1910); Milan, *P.* 13717 (1912); Jefferson, *P.* 16515, 16702 (1917); Randolph, *P.* 11654 (1908); (Gorham); Shelburne, *Deane* (1883, 1913); Martin Location, *P.* 14286 (1913).

Juncus effusus L., var. **solutus** Fern. & Wieg. (*Rhod.* 12 (1910), 90–92). Occasional.—Cambridge, Thirteen Mile Woods, *F.* & *P.* 16977 (1917); Northumberland, *F.* & *P.* 16695 (1917); Jefferson, *F.* & *P.* 16693, *P.* 16728 (1917); Randolph, *M.* 3198 (1906); Gorham, *F.* & *P.* 16844 (1917).

Juncus brachycephalus (Engelm.) Buchenau. Very local.—Stewartstown, Ladd Pond, *F.* & *P.* 16961 (1917).

Juncus brevicaudatus (Engelm.) Fern. Damp ground, common.—(Pittsburg); Dartmouth College Grant, *P.* 16258 (1914); (Stewartstown); Colebrook, *P.* 14053 (1912), *F.* & *P.* 16843 (1917); Cambridge, Lake Umbagog, *P.* 18204 (1921); Milan, *P.* 10538 (1907), 13709 (1912); Berlin, near Bog Dam, *P.* 9875 = *M.* 3210 (1906); Lancaster, *P.* 12377 (1909); Whitefield, *Deane*

(1897), *M.* 5049 (1913); (Jefferson); Randolph, *P.* 1563 (1902), *M.* 3201 (1906); Gorham, *M.* 4229 (1908), *P.* 16860 (1916); Shelburne, *Deane* (1883, 1884, 1913), *M.* 4876 (1911); (Pinkham Grant); Sargent Purchase, Huntington Ravine, 4000 ft., *F. & P.* 17651 (1917).

Juncus brevicaudatus × nodosus. Rare.—Colebrook, boggy pasture by Dixville road, *F. & P.* 17061 (1917).

Juncus canadensis J. Gay. Margins of ponds and slow streams, frequent in the southern part of the County.—Berlin, Head Pond, *P.* 14495 (1913), Dead River, *P.* 16514 (1915); Whitefield, Weed Pond, *P.* 14406 (1913), Burns Pond, *P.* 14576 = *M.* 5045 (1913), *P.* 17799 (1919); Jefferson, *W. Boott* (1873), Cherry Pond, *P.* 10665 (1907).

Juncus pelocarpus Mey. Wet sand and pond shores, occasional.—Cambridge, Lake Umbagog, *P.* 18181 (1921); Milan, Mud Pond, *P.* 13777 (1912); Berlin, Head Pond, *P.* 13762 (1912); Shelburne, *Deane* (1918); Jefferson, Cherry Pond, *P.* 10576 (1907); Whitefield, Burns Pond, *P.* 14575 (1913).

Juncus nodosus L. Frequent in the calcareous district in swamps and on wet banks.—Stewartstown, cedar bog, *F. & P.* 16673 (1917); Colebrook, *P.* 10360 = *M.* 3991, 10361 = *M.* 4001 (1907), *F. & P.* 16842 (1917); Columbia, Lime Pond, *P.* 10448 = *M.* 3833 (1907), Fish Pond, *P.* 13968 (1912).

LUZULA DC. Wood Rush.

Luzula saltuensis Fern. Woods and banks, especially in alluvial soil, frequent.—Pittsburg, Indian Stream valley, *P.* 14154 (1913); Atkinson & Gilmanton Academy Grant, *P.* 12637 (1910); Clarksville, *P.* 11036 = *M.* 3711 (1907); Dartmouth College Grant, Gorge of Diamond River, *P.* 10509 (1907); Stewartstown, *P.* 10207 = *M.* 3408 (1907), *F. & P.* 16780 (1917); Colebrook, *P.* 10916 = *M.* 3998, 3822 (1907), *F. & P.* 16639 (1917); Success, lumber railroad, *P.* 14129 (1913); Berlin, *P.* 16484 (1917); Lancaster, South Lancaster, *F. F. Forbes* (1901); Dalton, Dalton Mt., *P.* 16055 (1914); Whitefield, *P.* 16584 (1915); Carroll, Fabyans, *P.* 16658 (1916), Bretton Woods, *P.* 16689 (1916); Crawford Purchase, *P.* 11272 (1908); Jefferson, *P.* 16506 (1917); Randolph, *P.* 16744 (1916).

Luzula parviflora (Ehrh.) Desv., var. **melanocarpa** (Michx.) Buchenau. Common along alpine brooks and occasional at lower altitudes on moist banks.—Pittsburg, near Third Lake, *P.* 10306 (1907); Atkinson & Gilmanton Academy Grant, *P.* 12589 (1910); Stewartstown, *P.* 10206 = *M.* 3387 (1907); Colebrook, *P.* 10931 = *M.* 3984 (1907); (Success); Carroll, near Twin Mt., *P.* 16649 (1916), Bretton Woods, *P.* 11267 (1908), Mt. Deception, *P.* 11449 (1908); Randolph, *P.* 12752 (1910); Low & Burbank Grant, Jefferson Notch, *Deane* (1917), Valleyway, *P.* 289 (1901), *M.* 1100 (1903), 3195 (1906), 3357 (1907); Thompson & Meserve Purchase, Great Gulf, *E. & C. E. Faxon* (1887), *Williams* (1895), Carriage Road, *Deane* (1884), Cape Horn, *J. M. Greenman* (1898); Sargent Purchase, Tuckerman Ravine, *Miss S. Minns* (1888), *Williams* (1895), Lakes of the Clouds, *Williams* (1893); Mt. Washington, not definitely located, *F. Boott* (1816), *W. Boott* (1853), *W. F. Flint & J. H. Huntington* (1876), *J. A. Allen* (1878), *J. R. Churchill* (1890); Cutts Grant, base of Mt. Monroe, *M.* 4537 (1909); Bean Purchase, Carter Dome, *P.* 12901 (1910).

Luzula confusa Lindeberg. In the alpine region, local.—Thompson & Meserve Purchase, head of the Great Gulf, *E. & C. E. Faxon* (1878, 1879, 1886, 1887, 1894, 1895), *Williams* (1893, 1895), *P.* 12056 = *M.* 4538 (1909); Sargent Purchase, Alpine Garden, *E. & C. E. Faxon* (1888); Mt. Washington, not definitely located, *W. Boott* (1865), *C. G. Pringle* (1877); alpine region, not definitely located, *Oakes* (no date), *Tuckerman* (1843).

Luzula spicata (L.) DC. Alpine barrens, common, rarely descending.—Randolph, Ice Gulch, *P.* 10819 (1907); Low & Burbank Grant, Bruin Rock, 3300 ft., *P.* 12088 (1909), Valleyway, *M.* 3194 (1906), Mt. Madison, *P.* 293 (1900), Knife Edge, *P.* 10849 (1907); Thompson & Meserve Purchase, Madison Spring col, *P.* 1546 (1902), Mt. Adams, *A. P. Chadbourne* (1884), Carriage Road, *Deane* (1884), *P.* 10598 (1907); Sargent Purchase, summit of Mt. Washington, *H. A. Young* (1877), *Williams* (1893), Huntington Ravine, *E. & C. E. Faxon* (1878, 1879, 1885), Tuckerman Ravine, *E. D. Merrill* (1896), *M.* 5080 (1913); Mt. Washington, not definitely located, *F. Boott* (1816), *W. F. Flint & J. H. Huntington* (1876), *J. A. Allen* (1878), *J. R. Churchill*

(1890); Cutts Grant, Oakes Gulf, *J. M. Greenman* (1898); Bean Grant, Mt. Clinton, *M.* 1079 (1903); alpine region, not definitely located, *Oakes* (no date), *H. Mann* (1862).

Luzula campestris (L.) DC., var. **multiflora** (Ehrh.) Čelak. Meadows and open woods, common.—Pittsburg, First Lake, *P.* 10143 (1907), near Canaan line, *M.* 3754 (1907); Atkinson & Gilmanton Academy Grant, *P.* 12594 (1910); Dartmouth College Grant, *P.* 16146 (1914); (Colebrook); Stratford, *P.* 13542 (1912); (Northumberland); Milan, *P.* 13926 (1912); (Success); (Dalton); (Jefferson); Randolph, *P.* 1544 (1901), *M.* 967 (1903), *P.* 4148 (1904); (Gorham); Martin Location, *P.* 14259 (1913); Shelburne, *Deane* (1909, 1914); Carroll, *P.* 14384 (1913); (Low & Burbank Grant); (Thompson & Meserve Purchase); Sargent Purchase, summit of Mt. Washington, *Williams* (1901).

LILIACEAE (LILY FAMILY).

VERATRUM [Tourn.] L. False Hellebore.

Veratrum viride Ait. Lowland swamps and alpine meadows, common.—Pittsburg, near Third Lake, *M.* 3508 (1907); (Stewartstown); Colebrook, *P.* 10869 = *M.* 3995 (1907); (Cambridge); (Success); (Dalton); (Jefferson); Randolph, *M.* 987 (1903), *P.* 10703 (1907); (Gorham); Shelburne, *Deane* (1882, 1884, 1916); Low & Burbank Grant, *P.* 12341 (1909); Thompson & Meserve Purchase, Mt. Jefferson, *M.* 1922 (1904), Great Gulf, *Williams* (1895, 1897); Sargent Purchase, Alpine Garden, *P.* 10679 (1907), Tuckerman Ravine, *M.* 302 (1902).

OAKESIA Wats.

Oakesia sessilifolia (L.) Wats. Woods, common.—Dartmouth College Grant, *P.* 16240 (1914); Colebrook, *P.* 10464 (1907); (Millsfield); Stratford, *P.* 13448 (1912); (Stark); Berlin, *P.* 16116 (1914); (Dalton); (Jefferson); Randolph, *Williams* (1896), *P.* 4029 (1904), *Mrs. G. F. Moore* (1905), *M.* 4182 (1908); Gorham, *W. C. Cusick* (1887); Shelburne, *Deane* (1882, 1915), *Miss R. K. Stowell* (1916); (Carroll); (Low & Burbank Grant); (Sargent Purchase); (Bean Purchase).

ALLIUM [Tourn.] L. Onion.

Allium tricoccum Ait. Wild Leek. Rich woods, rare.—(Colebrook, according to Flint, *Geol. of N. H.* 1, 409); Lancaster, *P.* 12829 (1910).

Allium Schoenoprasum L. Chives. Randolph, garden escape, *M.* 4184 (1908).

HEMEROCALLIS L. Day Lily.

Hemerocallis fulva L. Roadside escape from cultivation.—Dummer, *P.* 16277 (1914); Randolph, Bowman, *P.* 11088 (1907); (Carroll); (Jefferson).

LILIUM [Tourn.] L. Lily.

Lilium philadelphicum L. Wood Lily. Dry soil, local.—Shelburne, *Deane* (1881, 1882, 1883), *Williams* (1903), *P.* 11839 = *M.* 4130 (1908).

Lilium canadense L. Wild Yellow Lily. Moist meadows, frequent.—Pittsburg, near Canaan line, *P.* 10364 = *M.* 3761 (1907); (Stewartstown); Colebrook, *P.* 10938 = *M.* 3940 (1907); Cambridge, *Williams* (1906); (Stratford); (Stark); (Northumberland); (Milan); (Berlin); Lancaster, *P.* 12253 (1909), *S. N. F. Sanford* (1914); (Dalton); (Carroll); Jefferson, *Williams* (1895); Randolph, *P.* 10517 (1907); Gorham, *P.* 14245 (1913); Shelburne, *Deane* (1882), *Williams* (1906).

Lilium tigrinum Ker. Tiger Lily. Occasional garden escape.—Randolph, *Williams* (1897), *P.* 12900 (1910); Gorham, *P.* 10794 (1907).

ERYTHRONIUM L. Dog's-tooth Violet.

Erythronium americanum Ker. Rich woods, frequent.—Pittsburg, Second Lake, *P.* 10342 = *M.* 3423 (1907); Stratford, *P.* 13591 (1912); (Northumberland); Randolph, *Mrs. G. F. Moore* (1905), *P.* 10863 = *M.* 3266, 3324 (1907), *P.* 11384 (1908), 16443 (1917); Shelburne, *Deane* (1909); Carroll, Fabyans, *Williams* (1898).

ASPARAGUS [Tourn.] L.

Asparagus officinalis L. Garden Asparagus. Occasional garden escape.—Gorham, *P.* 10810 (1907), *M.* 4264 (1908); Shelburne, *Deane* (1916).

CLINTONIA Raf.

Clintonia borealis (Ait.) Raf. Cool woods, common.—Pittsburg, First Lake, *P.* 11055, *M.* 3603 (1907); (Stewartstown);

(Colebrook); (Columbia); (Millsfield); Stratford, *P.* 13656 (1912); (Dummer); (Stark); (Northumberland); Success, *M.* 412 (1908); Berlin, *Deane* (1883); (Lancaster); (Dalton); Whitefield, *Deane* (1895); (Jefferson); Randolph, *Williams* (1896), *M.* 1043 (1903), *Mrs. G. F. Moore* (1905), *P.* 10153 = *M.* 3327 (1907); Gorham, *Williams* (1895); Shelburne, *Deane* (1882, 1904, 1916); (Carroll); (Low & Burbank Grant); Thompson & Meserve Purchase, Mt. Adams, *Miss F. C. Prince* (1892), *M.* 231 (1902), Great Gulf, *M.* 367 (1902), Carriage Road, *Deane* (1882); Sargent Purchase, Alpine Garden, *Williams* (1895); Cutts Grant, Mt. Monroe, *Williams* (1895), Oakes Gulf, *Williams* (1893), *M.* 4552 (1909); (Pinkham Grant); (Bean Purchase).

SMILACINA Desf. False Solomon's Seal.

Smilacina racemosa (L.) Desf. Moist woods, common.—Pittsburg, near Third Lake, *M.* 3511 (1907); (Colebrook); Columbia, *P.* 10886 (1907); (Millsfield); Stratford, *P.* 13629 (1912); (Stark); (Northumberland); (Berlin); (Lancaster); (Jefferson); Randolph, *M.* 1388 (1903), *Mrs. G. F. Moore* (1905), *P.* 12223 (1909); Shelburne, *Deane* (1882, 1883), *Miss R. K. Stowell* (1916).

Smilacina stellata (L.) Desf. Alluvial banks in the Connecticut valley, occasional.—Stratford, *P.* 13654 (1912); Northumberland, *P.* 12254 (1909); Lancaster, beside Israel River, *P.* 12816 (1910).

Smilacina trifolia (L.) Desf. Cold bogs, frequent.—Pittsburg, Second Lake, *P.* 10286 = *M.* 3434, 3462 (1907); Dartmouth College Grant, *P.* 16155 (1914); (Stewartstown); Colebrook, *P.* 10364 = *M.* 3786 (1907), *P.* 13938 (1912), *F. & P.* 16626 (1917); Dummer, *P.* 12621 (1910); Stark, *P.* 14140 (1913), 17437 (1919); Milan, Mud Pond, *P.* 13746 (1912); Success, summit of Mt. Success, *P.* 11302 = *M.* 4120 (1908); Berlin, Head Pond, *P.* 14501 (1913), near Bog Dam, *P.* 14152 (1913); Lancaster, *P.* 12239 (1909), 17173 (1918); Dalton, *P.* 12286 (1909); (Jefferson); Randolph, *P.* 11541 (1908); Shelburne, Wheeler's Bog, *Deane* (1882, 1914), summit of Shelburne Moriah Mt., *Miss A. W. Christensen & Miss C. A. Gauthier* (1917); Bean Purchase, Imp Camp, *P.* 16759 (1917), Mt. Lethe, *P.* 10522 (1907); Thompson & Meserve Purchase, Star Lake, *P.* 12340 (1909); Bean Grant, Mt. Jackson, *P.* 12319 (1909).

MAIANTHEMUM [Weber in] Wiggers.

Maianthemum canadense Desf. Moist woods and banks, very common.—Pittsburg, Second Lake, *P.* 10310 (1907); (Clarksville); Dartmouth College Grant, *P.* 16246 (1914); (Columbia); (Millsfield); Stratford, *P.* 13527 (1912); (Stark); (Northumberland); (Success); (Berlin); (Lancaster); (Dalton); (Jefferson); Randolph, *M.* 3248 (1907), *P.* 11146 (1908); (Gorham); Shelburne, *Deane* (1882, 1883), *G. L. Briggs* (1883); (Carroll); Low & Burbank Grant, Mt. Adams, *Miss F. C. Prince* (1892); Thompson & Meserve Purchase, Mt. J. Q. Adams, *P.* 12738 (1910); Sargent Purchase, Alpine Garden, *Williams* (1895), *P.* 10589 (1907), Tuckerman Ravine, *Williams* (1895); Cutts Grant, Oakes Gulf, *Williams* (1893, 1895); (Pinkham Grant); (Bean Purchase).

STREPTOPUS Michx. Twisted-stalk.

Streptopus amplexifolius (L.) DC. Cool woods, especially near brooks; also moist soil above the tree-line; frequent.—Stewartstown, *P.* 10190 = *M.* 3410 (1907); Dixville Notch, *Deane* (1917); Stratford, Sugarloaf Mt., *P.* 13569 (1912); (Success); (Dalton); Randolph, *P.* 318 (1901), 10341 (1907); (Gorham); (Pinkham Grant); Shelburne, *Deane* (1883), *C. E. Faxon* (no date); Carroll, Cherry Mt. Road, *Williams* (1895), *P.* 14439 (1913), Crawford's, *Williams* (1895); Low & Burbank Grant, Mt. Madison, *M.* 229 (1902); Thompson & Meserve Purchase, Carriage Road, *Deane* (1882), Cape Horn, *Williams* (1901); Sargent Purchase, Tuckerman Ravine, *J. R. Churchill* (1889, 1890), *M.* 4564 (1909), Lakes of the Clouds, *W. Boott* (1855); Cutts Grant, Oakes Gulf, *Williams* (1895).

Streptopus roseus Michx. Cool woods, common.—Stewartstown, *P.* 10114 = *M.* 3409 (1907); (Columbia); (Millsfield); Stratford, Sugarloaf Mt., *P.* 13568 (1912); (Stark); (Success); (Berlin); (Lancaster); Whitefield, *Deane* (1896); (Jefferson); Randolph, *Williams* (1897), *P.* 1593 (1901), *Mrs. G. F. Moore* (1905); Gorham, *P.* 16439 (1917); Shelburne, *Deane* (1882); Carroll, Crawford's, *Miss S. Minns* (no date); Low & Burbank Grant, *M.* 3354 (1907); Sargent Purchase, Tuckerman Ravine, *Miss H. L. Brown* (1885), *M.* 1071, 1086 (1903), 4563 (1909);

Cutts Grant, Crawford Path, *Williams* (1895), head of Oakes Gulf, *P.* 11138 (1908); (Pinkham Grant); (Bean Purchase).

POLYGONATUM [Tourn.] Hill. Solomon's Seal.

Polygonatum biflorum (Walt.) Ell. Wooded hillsides, frequent.—Columbia, *F. & P.* 16619 (1917); Millsfield, *P.* 18215 (1921); Stratford, *P.* 13632 (1912); (Stark); (Northumberland); (Jefferson); Randolph, *M.* 1465 (1903), 3257 (1907), *P.* 10816 (1907); Shelburne, *Deane* (1918).

MEDEOLA [Gronov.] L. Indian Cucumber-root.

Medeola virginiana L. Damp woods, common.—Pittsburg, First Lake, *P.* 11058 = *M.* 3613 (1907); (Stewartstown); (Colebrook); (Millsfield); (Northumberland); (Milan); Berlin, *P.* 16103 (1914); (Dalton); (Jefferson); Randolph, *Williams* (1895), *P.* 307 (1902), *M.* 952 (1903), 1920 (1904), 3252 (1907); (Gorham); Shelburne, *Deane* (1882, 1883); (Carroll); (Low & Burbank Grant); (Bean Purchase).

TRILLIUM L. Wake Robin.

Trillium cernuum L. Woods, rare.—Randolph, *P.* 321 (1901); specimen determined by Eames & Wiegand (*cf. Rhod.* 25 (1923), 191).

Trillium erectum L. Woods, common.—Pittsburg, First Lake, *P.* 11005 = *M.* 3636 (1907); (Stewartstown); (Columbia); (Millsfield); Stratford, *P.* 13653 (1912); (Dummer); (Stark); (Success); (Lancaster); Whitefield, *Deane* (1895); (Jefferson); Randolph, *Williams* (1895), *M.* 1391 (1905), 3263, 3325 (1907), *P.* 11324 (1908); Gorham, *Deane* (1904, 1909); Shelburne, *Deane* (1883); (Carroll); (Low & Burbank Grant); (Thompson & Meserve Purchase); (Bean Purchase).

Trillium undulatum Willd. Cool woods, common.—Pittsburg, Third Lake, *P.* 10998, *M.* 3484 (1907), Second Lake, *P.* 10112 (1907); Dartmouth College Grant, *P.* 16274 (1914); (Millsfield); Stratford, *P.* 13652 (1912); (Stark); (Northumberland); (Success); Lancaster, *S. N. F. Sanford* (1914); (Dalton); Jefferson); Randolph, *M.* 359 (1902), 2541 (1903), 3326 (1907); (Gorham); Shelburne, *Deane* (1882, 1883, 1884,

1893, 1909), *C. E. Faxon* (1886), *Miss R. K. Stowell* (1901); Carroll, Crawford's, *Williams* (1895); (Thompson & Meserve Purchase); (Bean Purchase).

SMILAX [Tourn.] L. Cat Brier.

Smilax herbacea L. Carrion-flower. Alluvial soil along the larger rivers, occasional.—Pittsburg, west of Indian Stream, *P.* 11052 = *M.* 3730 (1907); Stewartstown, *F.* & *P.* 16608 (1917); Stratford, *F.* & *P.* 17019 (1917); Stark, Percy, *P.* 14147 (1913); Northumberland, *F.* & *P.* 16573 (1917); Cambridge, *P.* 12620 (1910), Lake Umbagog, *P.* 16549 (1915); Dummer, *P.* 13943 (1912), 16541 (1917); Gorham, *P.* 12260 (1909); Shelburne, *P.* 11202 = *M.* 4173 (1908), *Deane* (1914, 1916).

IRIDACEAE (IRIS FAMILY).

IRIS [Tourn.] L. Fleur-de-lis.

Iris versicolor L. Wet places, common.—Pittsburg, First Lake, *Mrs. A. F. Stevens* (1895), *P.* 10359 = *M.* 3550 (1907); (Stewartstown); (Millsfield); Dixville Notch, *Williams* (1895); (Colebrook); Columbia, *M.* 3860 (1907); (Stratford); (Stark); (Northumberland); (Success); (Berlin); (Dalton); Jefferson, *P.* 16804 (1917); Randolph, *M.* 1141 (1903), *P.* 12242 (1909); (Gorham); (Green Grant); Shelburne, *Deane* (1882, 1883, 1914).

SISYRINCHIUM L. Blue-eyed Grass.

Sisyrinchium angustifolium Mill. Fields and meadows, common.—Pittsburg, First Lake, *P.* 10290 (1907), near Canaan line, *M.* 3750 (1907); Dartmouth College Grant, *P.* 16177 (1914); Stewartstown, *M.* 3692 (1907); (Colebrook); Stratford, *P.* 13516 (1912); (Dummer); Milan, *P.* 13817 (1912); (Success); (Berlin); (Lancaster); Whitefield, *Deane* (1896); (Jefferson); Randolph, *M.* 1005 (1903), *P.* 4150 (1904), 10063 (1907); Gorham, *W. C. Cusick* (1887); Shelburne, *Deane* (1883, 1909, 1913, 1914); Martin Location, *P.* 14251, 14371 (1913); Bean Purchase, Carter Notch, *P.* 4062 (1904); Thompson & Meserve Purchase, Cape Horn, *Williams* (1903); (Sargent Purchase); Carroll, Fabyans, *J. M. Greenman* (1898).

ORCHIDACEAE (ORCHIS FAMILY).

CYPRIPEDIUM L. Lady's Slipper.

Cypripedium arietinum R. Br. Ram's Head Lady's Slipper. Rich woods, very local.—Shelburne, Mt. Cabot, *Mrs. G. Sheffield* (1915), *Deane* (1915, 1918).

Cypripedium parviflorum Salisb. Smaller Yellow Lady's Slipper. Cedar bogs, very local.—Dalton, cedar bog west of Forest Lake, *P.* 17858 (1920).

Cypripedium parviflorum Salisb., var. **pubescens** (Willd.) Knight. Larger Yellow Lady's Slipper. Rich woods, local.—Lancaster, Mt. Prospect, *P.* 14317 (1913), *S. N. F. Sanford* (1914), north of Martin Meadow Pond, *P.* 17835 (1920).

Cypripedium acaule Ait. Stemless Lady's Slipper. Damp woods, common.—Pittsburg, near Third Lake, *P.* 11040 (1907), First Lake, *M.* 3654 (1907); (Colebrook); Carroll, Bretton Woods, *P.* 11333 (1908); (Thompson & Meserve Purchase); Low & Burbank Grant, *M.* 3357 (1907); Randolph, *Williams* (1895), *M.* 3249 (1907); Martin Location, *P.* 16473 (1917); Shelburne, *Deane* (1882, 1883, 1914).

Cypripedium acaule Ait., f. **albiflorum** Rand & Redfield. Damp woods, nearly as common as the typical form, at some stations replacing, at others intergrading with it.—Stratford, *P.* 13657 (1912); Carroll, Crawford's, *C. E. Faxon* (1899); Low & Burbank Grant, Jefferson Notch Road, *P.* 11361 (1908); Randolph, *P.* 345, 1595 (1901), 10113 = *M.* 3328, 3329, 3250, 3298 (1907); Green Grant, *P.* 13645 (1912); Shelburne, *Deane* (1882, 1914).

HABENARIA Willd. Rein Orchis.

Habenaria bracteata (Willd.) R. Br. Damp woods, frequent.—Pittsburg, Third Lake, *P.* 10415 (1907); Columbia, *F. & P.* 16587 (1917); Millsfield, *P.* 18211 (1921); Stratford, *P.* 13674 (1912); (Stark); Northumberland, *P.* 16498 (1917); Success, *P.* 16807 (1917); Lancaster, *P.* 14327 (1913), *S. N. F. Sanford* (1914); Jefferson, *P.* 16890 (1916); Randolph, *Williams* (1893, 1894), *H. A. Purdie* (1905), *P.* 10455 = *M.* 3321 (1907); Gorham, *P.* 16481 (1917); Shelburne, *Deane* (1883); Low & Burbank Grant, *Miss F. C. Prince* (no date), *P.* 367 (1901); Carroll, Crawford's, *H. St. John* (1909).

Habenaria flava (L.) Spreng., var. **virescens** (Muhl.) Fern. (*Rhod.* 23 (1921), 148). Boggy soil, rare.—Dalton, Cushman, *P.* 17406 (1919).

Habenaria hyperborea (L.) R. Br. Bogs and wet woods, occasional.—Pittsburg, First Lake, *P.* 10936 = *M.* 3542 (1907); Stewartstown, Ladd Pond, *F.* & *P.* 16632 (1917), South Hill, *P.* 14058 (1912); Colebrook, *F.* & *P.* 16589 (1917); Milan, *P.* 12721 (1910); Dalton, *P.* 16436 (1915); Randolph, *Williams* (1893); Shelburne, *Deane* (1917); Pinkham Grant, *Miss F. C. Prince* (1890).

Habenaria dilatata (Pursh) Gray. Bogs and wet woods, frequent.—Pittsburg, Third Lake, *P.* 10518 = *M.* 3491 (1907); Dixville Notch, *Williams* (1906); Milan, *P.* 12635 (1910); Success, *P.* 16806 (1917); Randolph, *Williams* (1893), *M.* 1129 (1903), *P.* 10839 (1907); Shelburne, Shelburne Moriah Mt., *A. C. Sprague* (1914); Pinkham Grant, Glen Ellis Fall, *Miss H. L. Brown* (1885), *Deane* (1916); Thompson & Meserve Purchase, Carriage Road, *Deane* (1884); Sargent Purchase, Tuckerman Ravine, *H. Mann* (1862), *Miss S. Minns* (1888), *E. D. Merrill* (1896), *P.* 375 (1900), *M.* 264 (1902); Mt. Washington, not definitely located, *W. F. Flint & J. H. Huntington* (1876); Cutts Grant, Crawford Path, *Williams* (1893), Oakes Gulf, *Williams* (1895), *P.* 12104 (1909); Bean Grant, Mt. Clinton, *P.* 12516 (1909); Crawford Purchase, *P.* 11334 (1908).

Habenaria clavellata (Michx.) Spreng. Bogs and wet ditches, frequent.—(Stewartstown); Milan, Mud Pond, *P.* 13878 (1912); Berlin, York Pond, *P.* 17163 (1918); Dalton, *P.* 12314 (1909); Jefferson, *P.* 16730 (1917); Randolph, *E. Faxon, C. E. Faxon* (1878), *Williams* (1893, 1896), *P.* 373 (1895), 372 (1900), 10770 (1907); Martin Location, *P.* 14331 (1913); Shelburne, *Deane* (1882, 1883, 1916), *P.* 11621 (1908), *Miss A. P. Lowell* (1914); Carroll, Crawford's, *Miss S. Minns* (1888); Thompson & Meserve Purchase, Base Station, *E.* & *C. E. Faxon* (1891).

Habenaria obtusata (Pursh) Richards. Damp, especially mossy, woods, frequent.—Pittsburg, Third Lake, *P.* 10416 (1907); Stewartstown, *F.* & *P.* 16594 (1917); Colebrook, *P.* 10752 = *M.* 3785 (1907), *F.* & *P.* 16659 (1917); (Columbia); Milan, *P.* 14054

(1912); Lancaster, *Deane* (1896); Randolph, *Williams* (1893), *M.* 3192, 3198 (1906); Gorham, *P.* 11422 (1908); Shelburne, *Deane* (1883); Carroll, Crawford's, *C. E. Faxon* (1878), *E. & C. E. Faxon* (1887), *Miss S. Minns* (1888); Low & Burbank Grant, *P.* 12330 (1909); Mt. Madison, *J. R. Churchill* (1889); Thompson & Meserve Purchase, Mt. Adams, *E. Faxon* (1878); Sargent Purchase, Tuckerman Ravine, *Williams* (1895), *M.* 281 (1902), 1081 (1903); Mt. Washington, not definitely located, *W. F. Flint & J. H. Huntington* (1876).

Habenaria Hookeri Torr. Woods, rare.—Shelburne, Philbrook Farm, *Deane* (1882, 1903, 1913, 1914).

Habenaria orbiculata (Pursh) Torr. Elephant's Ears. Rich woods, occasional.—Millsfield, *P.* 18209 (1921); Dixville Notch, *Williams* (1895); (Success); Whitefield, *Deane* (1895); Jefferson, *P.* 16891 (1916); Randolph, *Williams* (1893), *M.* 1146 (1903), *P.* 12324 (1909); Gorham, *C. E. Faxon* (1872); Shelburne, *Deane* (1882, 1883, 1916), *Miss A. N. Dike* (1915); Low & Burbank Grant, *P.* 10631 (1907); Thompson & Meserve Purchase, Madison Ravine, *P.* 12994 (1910); Bean Grant, Mt. Clinton, *H. St. John* (1909).

Habenaria macrophylla Goldie. Moist woods, occasional.—Lancaster, Mt. Prospect, *S. N. F. Sanford* (1914); Randolph, *Mrs. G. F. Moore* (1902, 1906), *P.* 10497 (1907), 12241 (1909); Low & Burbank Grant, *P.* 10630 (1907); Shelburne, *Deane* (1884); Bean Grant, Mt. Clinton, *H. St. John* (1909).

Habenaria blephariglottis (Willd.) Torr. White Fringed Orchis. Peat bogs, rare.—Dartmouth College Grant, *P.* 16152 (1914).

Habenaria psycodes (L.) Sw. Smaller Purple Fringed Orchis. Wet meadows, frequent in the Connecticut River system, rare in that of the Androscoggin.—(Stewartstown); Colebrook, *Williams* (1906), *P.* 13990 (1912); Milan, West Milan, *P.* 10795 (1907); Stark, *P.* 12768 (1910); Northumberland, *P.* 12238 (1909), *F. & P.* 16603 (1917); Lancaster, *P.* 12262 (1909), *S. N. F. Sanford* (1914); Shelburne, *Deane* (1881, 1882, 1884).

Habenaria fimbriata (Ait.) R. Br. Larger Purple Fringed Orchis. Damp woods and borders, common.—Dartmouth

College Grant, *P.* 16149 (1914); Errol, *Williams* (1906); Cambridge, *Williams* (1906); (Milan); Northumberland, *F. & P.* 16610 (1917); Whitefield, *P.* 14326 (1913); Carroll, Crawford's, *Miss S. Minns* (1888), *E. & C. E. Faxon*, *Williams* (1894), Cherry Mt. Road, *P.* 14428 (1913); Jefferson, *P.* 16768 (1917); Randolph, *Williams* (1893), *P.* 365, *M.* 269 (1902); Shelburne, *Deane* (1915).

Habenaria fimbriata (Ait.) R. Br., f. **albiflora** Rand & Redfield. Not common.—(Cambridge, reported by *W. Brewster* as frequent at Lakeside); Randolph, *Williams* (1893), *P.* 10520 (1907); Shelburne, *Deane* (1915).

POGONIA Juss.

Pogonia ophioglossoides (L.) Ker. Boggy shores of ponds, infrequent.—Stewartstown, Ladd Pond, *P.* 10905 = *M.* 3964 (1907), *F. & P.* 16633 (1917), Buck Pond, *F. & P.* 16577 (1917); Shelburne, Wheeler's Bog, *Deane* (1883).

CALOPOGON R. Br.

Calopogon pulchellus (Sw.) R. Br. Very local.—Shelburne, Wheeler's Bog, *Deane* (1881, 1882, 1883).

SPIRANTHES Richard. Ladies' Tresses.

Spiranthes gracilis (Bigel.) Beck. Dry pastures, frequent.—Northumberland, *P.* 12344 (1909); Carroll, *P.* 16581 (1915); Randolph, *Williams* (1896), *P.* 11788 (1908); Gorham, *P.* 11628 (1908), 13060 (1909); Shelburne, *Deane* (1883, 1914, 1916).

Spiranthes Romanzoffiana Cham. Dry pastures and boggy soil, common.—(Clarksville); Dartmouth College Grant, *P.* 16289 (1914); Dixville Notch, *E. & C. E. Faxon* (1887); Colebrook, *P.* 14023 (1912); Stark, *P.* 16780 (1916); Northumberland, Lost Nation, *Williams* (1906); Milan, *P.* 14055 (1912); Success, *P.* 10775 (1907); Kilkenny, Green Ledge, *P.* 14034 (1912); Lancaster, *P.* 12343 (1909); Jefferson, *P.* 10807 (1907); Carroll, near Fabyans, *E. & C. E. Faxon* (1887), *J. Robinson* (1902); Randolph, *E. & C. E. Faxon* (1878), *Williams* (1893), *P.* 10797 (1907); Gorham, *P.* 11527 (1908), 16565 (1915); Shelburne, *Deane* (1883, 1918), *Miss S. D. Sheppard* (1914).

EPIPACTIS [Haller] Boehm. Rattlesnake Plantain.

Epipactis repens (L.) Crantz, var. **ophioides** (Fern.) A. A. Eaton. Cold mossy woods, frequent, especially in primeval forest.—Colebrook, cedar bog, *P.* 14025 (1912), *F. & P.* 16666 (1917); Lancaster, Coös Junction, *P.* 12345 (1909); Carroll, Crawford's, *Miss S. Minns* (1888), *E. & C. E. Faxon* (1893, 1897); Randolph, *Williams* (1895), *H. J. Williams* (1896), *M.* 140 (1901), *P.* 349, 1056 (1902); Low & Burbank Grant, Durand Ridge, *Williams* (1895), Ravine of the Castles, *Williams* (1896), *H. J. Williams* (1897); Thompson & Meserve Purchase, Mt. Jefferson, *H. St. John* (1911); Sargent Purchase, *W. W. Eggleston* (1901); Bean Grant, near Mt. Jackson, *P.* 12515 (1909); Gorham, Mt. Hayes, *T. Morong* (1874); Bean Purchase, Carter Range, *H. J. Williams* (1896), North Carter Mt., *P.* 11109 (1907), West Royce Mt., *P.* 18141 (1921).

Epipactis tesselata (Lodd.) A. A. Eaton. Woods, chiefly coniferous, frequent.—Pittsburg, Third Lake, *P.* 10380 (1907), Second Lake, *P.* 11108 (1907), First Lake, *M.* 3593 (1907); Errol, *Williams* (1895); Millsfield, *P.* 18216 (1921); (Stark); Milan, *P.* 14035 (1912); Lancaster, Mt. Prospect, *P.* 16922 (1917); Jefferson, *P.* 16827 (1916); Randolph, *Williams* (1893, 1895, 1896), *H. J. Williams* (1895), *P.* 347 (1902), 4144 (1904), 9916 (1906); Gorham, *Williams* (1895); Shelburne, *Deane* (1883, 1914, 1916), *Miss E. Bull* (1914); Carroll, Crawford's, *Miss S. Minns* (1887; the specimens which formerly passed as *Goodyera Menziesii* Lindl.); Low & Burbank Grant, Ravine of the Castles, *H. J. Williams* (1897), Durand Ridge, *Williams* (1895); (Thompson & Meserve Purchase); Sargent Purchase, Tuckerman Ravine, *H. J. Williams* (1895); Bean Purchase, Carter Range, *H. J. Williams* (1896).

LISTERA R. Br. Twayblade.

Listera cordata (L.) R. Br. Mossy woods, occasional at lower elevations and common a little below tree-line.—Pittsburg, Second Lake, *P.* 10313 = *M.* 3435 (1907); Colebrook, cedar bog, *F. & P.* 16660 (1917); Carroll, Crawford's, *Miss S. Minns* (1888); Randolph, *M.* 3254 (1907); Gorham, *P.* 11244 (1908); Low & Burbank Grant, Mt. Adams, *E. & C. E. Faxon* (1878), Durand Ridge, *Miss E. W. Cook* (1893), *P.* 385, 1896 (1901),

10851 (1907); Thompson & Meserve Purchase, Six Husbands Trail, *P.* 12844 (1910), near Fabyan Path, *E. & C. E. Faxon* (1878); Sargent Purchase, Tuckerman Ravine, *W. H. Manning* (1881), *Williams* (1895); Mt. Washington, not definitely located, *F. Boott* (1816), *H. Mann* (1862), *J. A. Allen* (1878); Bean Grant, Mt. Clinton, *Williams* (1895); Bean Purchase, Carter Notch, *J. R. Churchill* (1890), *H. J. Williams* (1896).

Listera auriculata Wieg. Cedar bogs and mossy banks, infrequent.—Colebrook, near Beaver Falls, *F. & P.* 16596 (1917), cedar bog, *P.* 17857 (1920); Gorham, bank of Moose River, *P.* 11243 (1908); Bean Purchase, Wild River valley, *P.* 16016 (1914).

Listera convallarioides (Sw.) Torr. Shaded bogs, infrequent.—Dixville Notch, *Williams* (1906); Colebrook, *P.* 10753 (1907), *F. & P.* 16625 (1917); Randolph, path to Ice Gulch, *P.* 382 (1900), *M.* 1439 (1903); Carroll, Crawford's, *H. St. John* (1909).

CORALLORRHIZA [Haller] Chatelain. Coral Root.

Corallorrhiza trifida Chatelain. Damp woods, common.—Pittsburg, Third Lake, *P.* 10157 = *M.* 3483 (1907); Stewartstown, *F. & P.* 16663 (1917); Colebrook, *F. & P.* 16658 (1917), *P.* 17854 (1920); Columbia, *P.* 10376 (1907), *F. & P.* 16816 (1917); Stratford, *P.* 13658 (1912); Whitefield, *Deane* (1895); Jefferson, *P.* 18074 (1921); Randolph, *P.* 338 (1901), *M.* 983 (1903), *Mrs. G. F. Moore* (1905), *M.* 3244 (1907); Gorham, *P.* 16001 (1914); Shelburne, *W. G. Farlow* (1894), *Deane* (1903, 1904); Dalton, west of Forest Lake, *P.* 19053 (1922).

Corallorrhiza maculata Raf. Woods, frequent.—Atkinson & Gilmanton Academy Grant, *P.* 12719 (1910); Dixville Notch, *Williams* (1899); Stratford, Percy Peaks, *P.* 12858 (1910); Milan, *P.* 14056 (1912); Lancaster, Mt. Prospect, *P.* 14438 (1913); Randolph, *Williams* (1893, 1895), *P.* 340, 341 (1901), *M.* 3348 (1907); Gorham, *P.* 11368 (1908); Shelburne, *Deane* (1883, 1884, 1914), *C. E. Faxon* (no date); Martin Location, *P.* 14397 (1913); Sargent Purchase, Carriage Road, *P.* 14031 (1912); (Thompson & Meserve Purchase).

MICROSTYLIS (Nutt.) Eaton. Adder's Mouth.

Microstylis monophyllos (L.) Lindl. Cedar bogs, very rare.—Colebrook, cedar bog, *P.* 10940 = *M.* 3782 (1907).

Microstylis unifolia (Michx.) BSP. Bogs, pastures, and dry woods, frequent.—Dartmouth College Grant, *P.* 16158 (1914); Colebrook, *P.* 10755 = *M.* 3894 (1907), *F.* & *P.* 16598 (1917); (Columbia); Stratford, *F.* & *P.* 16906 (1917); Stark, *P.* 17463 (1919); Milan, *P.* 12720 (1910), 13963 (1912); (Berlin); Lancaster, *P.* 12252 (1909); Dalton, *P.* 16435 (1915); Whitefield, *Deane* (1896, 1897); Jefferson, *P.* 12856 (1910); Randolph, *Williams* (1893), *P.* 387, 388 (1900), *M.* 1411 (1903); Gorham, *P.* 13059 (1909); Shelburne, *Deane* (1883, 1916).

LIPARIS Richard. Twayblade.

Liparis Loeselii (L.) Richard. Boggy places, most frequent in the calcareous area.—Stewartstown, Ladd Pond, *P.* 10498 = *M.* 3963 (1907), *P.* 14062 (1912); Colebrook, *P.* 10754 = *M.* 3895 (1907), *F.* & *P.* 16597 (1917); Columbia, Lime Pond, *P.* 10756 = *M.* 3832 (1907); Milan, West Milan, *P.* 13955 (1912); Whitefield, pasture, *Deane* (1897).

SALICACEAE (WILLOW FAMILY).

SALIX [Tourn.] L. Willow.

Salix nigra Marsh., var. **falcata** (Pursh) Torr. Black Willow. River banks, infrequent.—Northumberland, *P.* 12131 (1909); Lancaster, *P.* 12285 (1909); Dartmouth College Grant, Diamond River, *P.* 16203 (1914).

Salix lucida Muhl. Shining Willow. Swamps, common.—Pittsburg, Second Lake, *P.* 10247 = *M.* 3458 (1907); (Clarksville); Stewartstown, *P.* 10322 = *M.* 3382 (1907); (Colebrook); (Columbia); Millsfield, *P.* 18175 (1921); (Stratford); (Stark); Northumberland, *P.* 13552 (1912); Milan, *P.* 13879 (1912); (Success); Berlin, *Deane* (1883), *P.* 17190 (1918); Whitefield, *Deane* (1896); Jefferson, *P.* 14401 (1913), 16491 (1917); Randolph, *P.* 432 (1902), *M.* 1017 (1903), *P.* 16434 (1917); (Gorham); Shelburne, *Deane* (1882, 1883, 1903); Carroll, Fabyans, *P.* 16646 (1916), 17561 (1919); Low & Burbank Grant, Jefferson Notch Road, *P.* 11247 (1908), King Ravine, *P.* 10658 (1907); (Thompson & Meserve Purchase).

Salix lucida Muhl., var. **angustifolia** Anders. Rare.—Colebrook, *F.* & *P.* 16630 (1917).

Salix lucida Muhl., var. **intonsa** Fern. Swamps, occasional.—Pittsburg, First Lake, *P.* 10160 = *M.* 3573 (1907); Stewartstown, Ladd Pond, *F.* & *P.* 16631 (1917); Columbia, Lime Pond, *F.* & *P.* 16815 (1917); Randolph, *P.* 10828 (1907); Gorham, *P.* 13660 (1912); (Berlin).

Salix alba L., var. caerulea (Sm.) Koch. Introduced, persistent, and rarely spreading.—Pittsburg, *P.* 11026 = *M.* 3727 (1907); Randolph, *Williams* (1896); Gorham, *M.* 4230 (1908), *P.* 16363 (1915); Shelburne, *P.* 11132 = *M.* 4137 (1908), *Deane* (1917).

Salix alba L., var. vitellina (L.) Koch. Similarly introduced.—Northumberland, *P.* 12133 (1909); Randolph, *P.* 4161 (1904); Shelburne, *Deane* (1909).

Salix cordata Muhl. Moist places, common.—Pittsburg, First Lake, *P.* 10285 = *M.* 3572, 3574, *P.* 10120 = *M.* 3608 (1907); Columbia, *P.* 13982 (1912); Stratford, *P.* 13514, 13532 (1912); Northumberland, *P.* 13579 (1912); (Dummer); (Milan); (Success); (Dalton); Whitefield, *Deane* (1896), *M.* 4347 (1908); (Jefferson); Randolph, *Williams* (1896), *M.* 215 (1902), *Mrs. G. F. Moore* (1905), *M.* 3293 (1907), *P.* 16426 (1917); Gorham, *M.* 4235 (1908); Shelburne, *Deane* (1884, 1902, 1909, 1910, 1916); Carroll, Fabyans, *Tuckerman* (1842); Thompson & Meserve Purchase, Jacob's Ladder, *E.* & *C. E. Faxon* (1885), Cape Horn, *Williams* (1903), Carriage Road, 4000 ft., *F.* & *P.* 16886 (1917); Bean Purchase, Carter Notch, *P.* 4091 (1904).

Salix cordata Muhl., var. **myricoides** (Muhl.) Carey. Local.—Stewartstown, *F.* & *P.* 16576 (1917); Randolph, *P.* 433 (1902), 10825 (1907), 12030 (1909), 16292 (1914), 16424 (1917).

Salix pyrifolia Anders. (*S. balsamifera* Barratt; *cf. Rhod.* 16 (1914), 116). Low ground, frequent.—Pittsburg, Second Lake, *P.* 10345, 10346 = *M.* 3453, 3454 (1907), First Lake, *P.* 10119 = *M.* 3602 (1907); (Stewartstown); Colebrook, *P.* 13937 (1912), *F.* & *P.* 16669, 17063 (1917); Errol, *P.* 10516 (1907); Dummer, *P.* 12654 (1910); Northumberland, *P.* 12115 (1909); Milan, *P.* 13880 (1912); Success, *P.* 10638 (1907), 16533 (1917); Berlin, *P.* 13763 (1912); Lancaster, *P.* 12109 (1909); Dalton, *P.* 12323 (1909); Jefferson, *P.* 16587 (1915); Randolph, *M.* 4206 (1908), *P.*

17320 (1918); Shelburne, Shelburne Moriah, *W. H. Munter* (1919); Carroll, *P.* 12715 (1910), Fabyans, *E. Faxon* (1882), Crawford's, *C. G. Pringle, E. & C. E. Faxon* (1879), *Williams* (1895); Crawford Purchase, by Ammonoosuc River, *E. Faxon* (1879, 1883), *Williams* (1895); Thompson & Meserve Purchase, near Base Station, *E. & C. E. Faxon* (1880, 1882, 1883, 1885, 1886), Clay Ravine, *P.* 14358 (1913), Carriage Road, *P.* 10533 (1907); Sargent Purchase, Ammonoosuc Ravine, *P.* 16761 (1916), Lakes of the Clouds, *W. Boott* (1855); Mt. Washington, not definitely located, *E. & C. E. Faxon* (1888).

Salix pedicellaris Pursh, var. **hypoglauca** Fern. (*Rhod.* 11 (1909), 161–162). Meadows, local.—Randolph, *P.* 11218 (1908), 12360 (1909), 17332 (1918).

Salix Uva-ursi Pursh. Alpine regions, common.—Low & Burbank Grant, King Ravine, *P.* 12091 (1909), 14433 (1913), Spur Trail, *M.* 3365 (1907); Thompson & Meserve Purchase, Mt. Madison, *P.* 10560 (1902), 10226 = *M.* 3347 (1907), Great Gulf, *E. Faxon* (1887), Carriage Road, *Deane* (1882), *Williams, J. M. Greenman* (1898), *P.* 4105 (1904); Sargent Purchase, Alpine Garden, *Williams* (1898); Tuckerman Ravine, *J. R. Churchill* (1890), *W. G. Farlow* (1894), *P.* 430 (1902), *M.* 1061 (1903), Crawford Path, *E. & C. E. Faxon* (1893), Lakes of the Clouds, *W. Boott* (1853), *E. Faxon* (1885), *E. & C. E. Faxon* (1886), *Williams* (1893), Mt. Pleasant, *Miss S. Minns* (1885); Mt. Washington, not definitely located, *E. & C. E. Faxon* (1875), *W. F. Flint & J. H. Huntington* (1876), *C. H. Hitchcock* (1886), *W. W. Eggleston* (1903); Cutts Grant, Mt. Monroe, *M.* 268 (1902); alpine region, not definitely located, *Oakes* (no date), *Tuckerman* (no date), *J. A. Lowell* (no date), *H. Mann* (1862), *J. W. Chickering* (no date).

Salix Peasei Fern. (probably a hybrid of *S. herbacea* and *S. Uva-ursi; cf. Rhod.* 19 (1917), 220–222; also *Bot. Gaz.* 67 (1919), 51–52). Very local.—Low & Burbank Grant, King Ravine, *ca.* 4500 ft., *P.* 12091 (1909), 14433 (1913), *F. & P.* 16847 (1917). The last-named is the type collection of this species.

Salix herbacea L. Moist heads of ravines in the alpine region, frequent.—Low & Burbank Grant, King Ravine, *P.* 12101 (1909);

Thompson & Meserve Purchase, Great Gulf, *W. Boott* (1855), *E. & C. E. Faxon* (1877, 1878, 1887, 1895), *Williams* (1893, 1895, 1897), *M.* 265 (1902), *P.* 11212 (1908); Sargent Purchase, Tuckerman Ravine, *J. A. Allen* (no date), *W. W. Eggleston* (1899), *P.* 428 (1902); Mt. Washington, not definitely located, *A. Gray* (1842), *W. Boott* (1853), *E. & C. E. Faxon* (1880), *J. M. Greenman* (1898); alpine region, not definitely located, *Oakes* (no date), *J. A. Lowell* (1847).

Salix discolor Muhl. Moist places, common.—Pittsburg, First Lake, *P.* 10117 = *M.* 3600 (1907); (Colebrook); Columbia, *P.* 13981 (1912); (Success); (Lancaster); Whitefield, *Deane* (1896); (Jefferson); Randolph, *Williams* (1896), *Mrs. G. F. Moore* (1905), *M.* 4178, 4195 (1908), *P.* 11781 (1908), 16429 (1917); Gorham, *P.* 10611, 10612 = *M.* 4051, 4052 (1907); Shelburne, *Deane* (1904, 1910); (Low & Burbank Grant); Thompson & Meserve Purchase, Carriage Road, 4000 ft., *F. & P.* 16893 (1917).

Salix petiolaris Sm. Swamps, infrequent.—Colebrook, *F. & P.* 16951 (1917); Jefferson, *P.* 10782 (1907).

Salix humilis Marsh. Dry roadsides, common.—(Colebrook); Milan, *P.* 13829 (1912); Success, *P.* 10671 (1907); (Berlin); Whitefield, *Deane* (1896), *P.* 14562 (1913); (Carroll); (Jefferson); Randolph, *Mrs. G. F. Moore* (1905), *P.* 12180, 12346 (1909), 16428 (1917); (Gorham); Shelburne, *Deane* (1882, 1904); (Low & Burbank Grant); Thompson & Meserve Purchase, Carriage Road, 4000 ft., *F. & P.* 16892 (1917).

Salix sericea Marsh. Silky Willow. Wet places, common.—Pittsburg, Second Lake, *P.* 10437 (1907), near Indian Stream, *P.* 11015 = *M.* 3746 (1907); Stewartstown, *F. & P.* 16676 (1917); Colebrook, *F. & P.* 16954 (1917); Milan, *P.* 13730 (1912), 17322 (1918); Berlin, *P.* 13826 (1912); Whitefield, *Deane* (1896); (Jefferson); Randolph, *P.* 431 (1902), 10827, 10048 = *M.* 3271 (1907), 11719 (1908), 16440 (1917); Low & Burbank Grant, King Ravine, *P.* 10657 (1907); Shelburne, *M.* 4166 (1908), *Deane* (1919).

Salix rostrata Richards. Moist and dry soil, very common.—Pittsburg, First Lake, *P.* 10180 = *M.* 3532 (1907); Dartmouth College Grant, *P.* 16178 (1914); Stewartstown, *P.* 10323 = *M.*

3381 (1907); (Columbia); (Millsfield); Stratford, *P.* 13487 (1912); (Stark); (Milan); (Success); (Berlin); (Kilkenny); (Lancaster); Dalton, *M.* 5004 (1913); Whitefield, *Deane* (1896); (Jefferson); Randolph, *Williams* (1896), *P.* 6415 (1904), *Mrs. G. F. Moore* (1907), *M.* 3312 (1907), *P.* 16435 (1917); (Gorham); Shelburne, *Deane* (1883, 1904, 1910, 1916); Carroll, *P.* 16648 (1916); (Low & Burbank Grant); Thompson & Meserve Purchase, Jacob's Ladder, *E. & C. E. Faxon* (1885), Cape Horn, *Williams* (1903), Carriage Road, 4000 ft., *F. & P.* 16885 (1917); Sargent Purchase, Glen Lake, *E. & C. E. Faxon* (1885); Martin Location, *P.* 16422 (1917); Bean Purchase, *M.* 5073 (1913), Wild River valley, *P.* 16050 (1914), North Baldface Mt., *P.* 16045 (1914).

Salix argyrocarpa Anders. Moist heads of ravines in the alpine region, locally abundant.—Sargent Purchase, Tuckerman Ravine, *C. G. Pringle* (1877), *W. G. Farlow* (1884), *C. R. Lamb* (1884), *E. & C. E. Faxon* (1885, 1886, 1887, 1890), *J. R. Churchill* (1890), *Williams* (1893, 1895), *W. W. Eggleston* (1898, 1899), *P.* 427 (1902), *M.* 263 (1902), 1062 (1903), *P.* 12075 = *M.* 4571, 4566 (1909), Lakes of the Clouds, *W. Boott* (1855), *E. & C. E. Faxon* (1878, 1886, 1888), *J. A. Allen* (1880), *Williams* (1893), Ammonoosuc Ravine, *P.* 16765 (1916); Cutts Grant, Oakes Gulf, *E. & C. E. Faxon* (1889), *Williams, J. M. Greenman* (1898), *P.* 12041 = *M.* 4551 (1909); Mt. Washington, not definitely located, *W. Boott* (1853), *W. F. Flint & J. H. Huntington* (1876); alpine region, not definitely located, *Oakes* (1825), *H. Mann* (1862), *J. W. Chickering* (1862, 1875), *W. Boott* (1865), *Miss S. Minns* (no date).

Salix argyrocarpa × planifolia. Very local.—Sargent Purchase, Tuckerman Ravine, *E. & C. E. Faxon* (1885, 1886, 1887, 1890), *J. R. Churchill* (1890), *Williams* (1895), *W. W. Eggleston* (1899), Ammonoosuc Ravine, *P.* 16766 (1916). According to Gray's *Manual*, 6 ed. (1889), 483, this was collected in Tuckerman Ravine by Dr. Gray as early as 1842. He apparently, however, was in doubt as to its identity; *cf.* M. S. Bebb in *Bull. Torr. Bot. Club*, **17** (1890), 149–150.

Salix pellita Anders. Swamps along the upper parts of the Connecticut and Androscoggin Rivers, frequent.—Pittsburg, Second Lake, *P.* 10344 = *M.* 3416 (1907); Clarksville, *P.* 11029 =

M. 3722 (1907); Stewartstown, *F.* & *P.* 16674, 17004 (1917); Columbia, *P.* 17680 (1919); Stratford, *P.* 17707 (1919); Northumberland, *P.* 12135 (1909), 13628 (1912), Horseshoe Pond, *P.* 17262 (1918); Lancaster, Coös Junction, *P.* 12215 (1909); Dalton, *P.* 11538 = *M.* 4377 (1908); Wentworth Location, Magalloway River, *P.* 10623 (1907); Cambridge, Lake Umbagog, *P.* 16537 (1915), 18177 (1921); Errol, *P.* 12622 (1910), 16219 (1914).

Salix planifolia Pursh (*S. phylicifolia* Man., not L.; *cf. Journ. Arn. Arbor.* 1 (1920), 75). Moist alpine ravines, frequent.—Low & Burbank Grant, Snyder Brook, *P.* 12310 (1909), 14159 (1913); Thompson & Meserve Purchase, Great Gulf, *E.* & *C. E. Faxon* (1885, 1886, 1887, 1890); Sargent Purchase, Alpine Garden, *E. Faxon* (1885), *Williams*, *J. M. Greenman* (1898), *P.* 434 (1902), 10552 (1907), Huntington Ravine, *F.* & *P.* 16850 (1917), Tuckerman Ravine, *E.* & *C. E. Faxon* (1884, 1887), *J. R. Churchill* (1890), *Williams* (1893, 1895, 1897), *W. W. Eggleston* (1899), *M.* 301 (1902), 1063 (1903), *P.* 12076 = *M.* 4570, 4567 (1909), Lakes of the Clouds, *E.* & *C. E. Faxon* (1886, 1887, 1888); Mt. Washington, not definitely located, *W. F. Flint* & *J. H. Huntington* (1876), *E.* & *C. E. Faxon* (1878, 1888); Cutts Grant, Oakes Gulf, *P.* 11142 (1908); alpine region, not definitely located, *Oakes* (1825), *A. Gray* (1842).

POPULUS [Tourn.] L. Poplar; Aspen.

Populus tremuloides Michx. Dryish woods, common.—Pittsburg, First Lake, *P.* 10100 = *M.* 3568 (1907); (Stewartstown); Columbia, Lime Pond, *W. Boott* (1855). *P.* 11082 = *M.* 3631 (1907); (Errol); (Cambridge); Stratford, *P.* 13458 (1912); (Dummer); (Stark); (Northumberland); (Milan); (Success); (Berlin); (Lancaster); Dalton, *M.* 5025 (1913); (Jefferson); Randolph, *Williams* (1896), *P.* 11233, *M.* 4455 (1908); Gorham, *P.* 16077 (1914); Shelburne, *Deane* (1882, 1909, 1910); (Carroll); Low & Burbank Grant, Valleyway, 3200 ft., *P.* 16480 (1917); Green Grant, *M.* 4303 (1908); Bean Purchase, *M.* 5076 (1913).

Populus grandidentata Michx. Large-toothed Aspen. Woods and borders of fields, common.—(Colebrook); (Columbia); (Stratford); (Milan); (Berlin); Dalton, *P.* 14564 = *M.* 5000 (1913); Randolph, *Williams* (1896), *P.* 11782, *M.* 4456 (1908);

Gorham, *M.* 4885 (1911), *P.* 16082 (1914); Shelburne, *Deane* (1882), *M.* 4153 (1908), 4868 (1911); (Thompson & Meserve Purchase); (Sargent Purchase).

Populus tacamahacca Mill. (*P. balsamifera* of authors; *P. tacamahacca* Mill., var. *lanceolata* (Marsh) Farwell (*Rhod.* 21 (1919), 101; *cf. Journ. Arn. Arbor.* 1 (1919), 61). Balsam Poplar. Low ground, frequent.—Clarksville, *P.* 11069 = *M.* 3696 (1907); Columbia, Lime Pond, *M.* 3836 (1907), *P.* 13983 (1912); Northumberland, *P.* 13583 (1912); Milan, *P.* 13881 (1912); Berlin, near York Pond, *P.* 17191 (1918); Whitefield, *Deane* (1896, 1919); Randolph, *Williams* (1897), *P.* 9915 (1906), *M.* 4241 (1908), *P.* 2224 (1909); Gorham, *M.* 4056 (1907), *P.* 12898 (1910); Martin Location, *P.* 12852 (1910); Shelburne, *Deane* (1909, 1914).

Populus candicans Ait. (*P. tacamahacca* Farwell (not Mill.) in *Rhod. l. c.*). Balm of Gilead. An occasional escape.—Whitefield, *M.* 4350 (1908); Shelburne, *P.* 11150 = *M.* 4100 (1908).

MYRICACEAE (SWEET GALE FAMILY).

MYRICA L.

Myrica Gale L. Borders of ponds and slow streams, common.—Pittsburg, Second Lake, *P.* 10253 = *M.* 3419 (1907); Stewartstown, Buck Pond, *F.* & *P.* 16812 (1917); Success, Success Pond, *P.* 16556 (1917); Berlin, Dead River, *P.* 4200 (1904), York Pond, *P.* 17171 (1918); Dalton, *P.* 11583 = *M.* 4401 (1908), Forest Lake, *P.* 17564 (1919); Whitefield, *Deane* (1896), *M.* 5033 (1913); Randolph, Pond of Safety, *P.* 12704 (1910); Gorham, *P.* 16903 (1916); Shelburne, *Deane* (1883, 1914).

Myrica Gale L., var. **subglabra** (Chevalier) Fern. (*Rhod.* 16 (1914), 167). Similar localities, especially northward.—Cambridge, Lake Umbagog, *P.* 18152 (1921); Errol, Thirteen Mile Woods, *P.* 16276 (1914); Milan, West Milan, *P.* 13722 (1912); Northumberland, lower Jonathan Pond, *P.* 13549 (1912).

Myrica asplenifolia L. Sweet Fern. Dry soil, abundant in the region of Shelburne, infrequent elsewhere.—Milan, West Milan, *P.* 13714 (1912); Berlin, east of Head Pond, *P.* 19082 (1922), near Jasper Cave, *P.* 16511 (1915); Gorham, *P.* 16076 (1914); Shelburne, *Deane* (1882, 1883), *A. E. Philbrook* (1886),

Deane (1904), *P.* 10778 (1907), 11131 = *M.* 4135 (1908), *Deane* (1909); Whitefield, *P.* 11567 = *M.* 4488 (1908), *P.* 14212 (1913).

JUGLANDACEAE (WALNUT FAMILY).

JUGLANS L. Walnut.

Juglans cinerea L. Butternut. Along the larger valleys in alluvial soil; at Stark on rocky talus; often planted, but in many places clearly indigenous; in some places earlier much more abundant than at present (*cf.* Farmer & Moore, *Gazetteer of N. H.* (1823), 202, for Northumberland).—Pittsburg, near Third Lake, *P.* 10297 (1907), Second Lake, *M.* 3428 (1907); Colebrook, *M.* 3897 (1907); Stratford, *P.* 13557 (1912); Stark, talus of Devil's Slide, *P.* 17469 (1919); Northumberland, *P.* 12222 (1909); Whitefield, *P.* 11560 = *M.* 4392 (1908); Randolph, *Mrs. G. F. Moore* (1905), *P.* 11145, *M.* 4221 (1908); Shelburne, *Deane* (1883, 1918).

Juglans nigra L. Introduced and persistent.—Lancaster, near Grange, *P.* 16097 (1914).

BETULACEAE (BIRCH FAMILY).

CORYLUS [Tourn.] L. Hazel; Filbert.

Corylus rostrata Ait. Beaked Hazelnut. Thickets, common.—Pittsburg, First Lake, *P.* 10102 = *M.* 3625 (1907); Dartmouth College Grant, *P.* 16185 (1914); Clarksville, *P.* 11023 = *M.* 3698 (1907); (Stewartstown); (Columbia); (Millsfield); (Stratford); (Stark); (Northumberland); (Success); (Berlin); (Dalton); Whitefield, *Deane* (1896); Jefferson, *P.* 16493 (1917); Randolph, *P.* 451 (1902), 4099 (1904), *M.* 4180 (1908); (Gorham); Shelburne, *Deane* (1882, 1883), *A. E. Philbrook* (1886, 1891); Carroll, Fabyans, *Williams* (1895); (Low & Burbank Grant); (Bean Purchase).

OSTRYA [Mich.] Scop. Hop Hornbeam.

Ostrya virginiana (Mill.) K. Koch. Rich woods, frequent.—Colebrook, *P.* 11045 = *M.* 3815 (1907); Columbia, *P.* 10408 = *M.* 3915 (1907); (Stark); Lancaster, *P.* 14541 (1913), 16731 (1916); Dalton, *P.* 14570 (1913); Carroll, *P.* 17434 (1919); Randolph, *Williams* (1897), *P.* 4099 (1904), 12018 (1909); Shelburne, *Deane* (1882, 1883), *P.* 12205 (1909); (Bean Purchase).

BETULA [Tourn.] L. Birch.

Betula lutea Michx. f. Yellow Birch. Rich woods, common.—Pittsburg, near Third Lake, *P.* 10307 = *M.* 3504, 3518 (1907); (Columbia); (Millsfield); Stratford, *P.* 13459 (1912); (Stark); (Northumberland); (Milan); (Success); (Dalton); Whitefield, *Deane* (1895); (Jefferson); Randolph, *M.* 1429 (1903), *Mrs. G. F. Moore* (1905), *M.* 4191 (1908); (Gorham); Shelburne, *Deane* (1883); (Carroll); (Low & Burbank Grant); (Pinkham Grant); (Bean Purchase).

Betula lutea Michx. f., var. **macrolepis** Fern. (*Rhod.* 24 (1922), 170).—Randolph, *P.* 440 (1902).

Betula populifolia Marsh. Gray Birch. Poor soil, frequent.—Colebrook, *P.* 10412 = *M.* 3913 (1907); (Millsfield); (Stark); Milan, *P.* 13806 (1912); Berlin, York Pond, *P.* 17164 (1918); (Dalton); Whitefield, *M.* 4393 (1908); Jefferson, *P.* 14361 (1913); Randolph, *P.* 4118, 4119 (1904), *M.* 4043 (1907); (Gorham); Shelburne, *Deane* (1882); Martin Location, *P.* 12853 (1910).

Betula caerulea-grandis Blanchard (*B. pendula* of the *Manual; cf. Rhod.* 24 (1922), 171–173). Roadsides, etc., rare.—Randolph, *P.* 16298 (1914); Shelburne, *Deane* (1914); Green Grant, *T. W. Edmondson*, 5321 (1914).

Betula papyrifera Marsh. (*B. alba* L., var. *papyrifera* (Marsh.) Spach.; *cf. Rhod.* 23 (1921), 257). Paper, Canoe, or White Birch. Woods, abundant.—Pittsburg, Third Lake, *P.* 10193 = *M.* 3489 (1907); Dartmouth College Grant, *P.* 16157 (1914); Columbia, *P.* 10489 = *M.* 3874 (1907); Stratford, *P.* 13530 (1912); (Stark); Milan, *P.* 13841 (1912); (Success); (Berlin); Lancaster, *P.* 17816 (1920); Dalton, *P.* 17379 (1919); Randolph, *P.* 4045 (1904), 17470 (1919); Gorham, *M.* 4055 (1907), *P.* 16080 (1914); Shelburne, *Deane* (1882, 1883, 1914), *A. E. Philbrook* (1886); (Carroll); (Low & Burbank Grant).

Betula papyrifera Marsh., var. **cordifolia** (Regel) Fern. (*B. alba* L., var. *cordifolia* (Regel) Fern.; *cf. Rhod.* 23 (1921), 257). Woods and pastures, common; reduced to a scrub form at treeline.—Pittsburg, First Lake, *P.* 10104 = *M.* 3627 (1907), *P.* 10118 = *M.* 3601 (1907); (Colebrook); (Millsfield); (Milan); Success, Mt. Success, *P.* 11129 = *M.* 4123 (1908); (Berlin);

Randolph, *Williams* (1895), *M.* 1456 (1903), 4210 (1908), *P.* 12220 (1909); (Gorham); Shelburne, *Deane* (1883); (Pinkham Grant); Carroll, Fabyans, *C. H. Bissell* (1902); Low & Burbank Grant, Mt. Madison, *M.* 228 (1902); Thompson & Meserve Purchase, Cape Horn, *J. M. Greenman* (1898), Carriage Road, *Williams* (1901); Sargent Purchase, Alpine Garden, *E. Faxon* (1877), *J. M. Greenman* (1898), Tuckerman Ravine, *Williams* (1895), *W. W. Eggleston* (1901), *M.* 5088 (1913); Mt. Washington, not definitely located, *W. Boott* (1853); Hadley Grant, Mt. Crawford, *P.* 11731 (1908); Bean Purchase, Carter Notch, *M.* 5075 (1913).

Betula papyrifera Marsh., var. **minor** Tuckerm. (*B. alba* L., var. *minor* (Tuckerm.) Fern., *cf. Rhod. l.c.*). Common in the alpine region, rare at lower levels.—Randolph, Ice Gulch, *P.* 10750 (1907), 16707 (1917); Low & Burbank Grant, Duck Fall, *P.* 14160 (1913), Nowell Ridge, *P.* 12316 (1909); Thompson & Meserve Purchase, Cape Horn, *Williams, J. M. Greenman* (1898), Carriage Road, *Deane* (1882), *P.* 10532 (1907); Sargent Purchase, Alpine Garden, *E. & C. E. Faxon* (1893), *Williams* (1895), *P.* 445 (1902), Lakes of the Clouds, *P.* 446 (1902), Crawford Path, *Williams* (1893); Mt. Washington, not definitely located, *W. Boott* (1853), *E. Faxon* (1886), *Williams* (1898), *W. W. Eggleston* (1903); Cutts Grant, Oakes Gulf, *J. R. Churchill, Williams* (1895); alpine region, not definitely located, *Oakes* (no date).

Betula glandulosa Michx. Alpine region westward from Mt. Washington, local.—Sargent Purchase, Lakes of the Clouds, *C. E. Faxon* (1878), *J. A. Allen* (1880), *J. R. Churchill* (1895); Mt. Washington, not definitely located, *C. G. Pringle* (1877); Cutts Grant, Crawford Path, *P.* 11180 (1908).

Betula glandulosa Michx., var. **sibirica** (Ledeb.) Blake (*Rhod.* 17 (1915), 87). More abundant and generally distributed in the alpine region.—Thompson & Meserve Purchase, Mt. Adams, *P.* 10844, 10845 (1907), Mt. Clay, *J. M. Greenman* (1898), Cape Horn, *Williams* (1898); Sargent Purchase, Bigelow Lawn, *W. W. Eggleston* (1899), Lakes of the Clouds, *E. & C. E. Faxon* (1886, 1887), *Williams* (1896, 1901), *P.* 444 (1902), *W. W. Eggleston* (1903); Mt. Washington, not definitely located, *T. Morong* (1874), *W. F. Flint & J. H. Huntington* (1876), *E. & C. E. Faxon*

(1878), *W. G. Farlow* (1884); Cutts Grant, *M.* 4540 (1909), Mt. Monroe, *Williams* (1898), *M.* 267 (1902), Oakes Gulf, *Williams* (1895, 1896), Mt. Franklin, *P.* 16759 (1916); alpine region, not definitely located, *Oakes* (no date), *Tuckerman* (no date), *A. Gray* (1842), *C. G. Pringle* (1878).

ALNUS [Tourn.] Hill. Alder.

Alnus crispa (Ait.) Pursh. Green Alder. Chiefly on the Presidential Range, common, especially in mountain ravines.—Randolph, 1½ m. west of Appalachia station, *P.* 17600 (1919); Thompson & Meserve Purchase, Cape Horn, *B. L. Robinson* (1901); Sargent Purchase, Tuckerman Ravine, *W. Boott* (1855), *E. S. Hoar* (1858), *E. & C. E. Faxon* (1887), *P.* 438 = *M.* 300 (1902); Cutts Grant, Oakes Gulf, *Williams* (1895).

Alnus crispa (Ait.) Pursh, var. **mollis** Fern. (*A. mollis* Fern.; *cf. Rhod.* 15 (1913), 44). Mountain ravines, and often in gravelly soil at lower levels; more commonly distributed than the last.—Dartmouth College Grant, Gorge of the Diamond River, *P.* 12638 (1910); Cambridge, Lake Umbagog, *P.* 16528 (1915); Randolph, *Williams* (1896), *P.* 12278, 12086 = *M.* 4525 (1909), *P.* 16425 (1917); Gorham, *P.* 12195 (1909), 16434 (1915); Shelburne, *Deane* (1882, 1883, 1884); Carroll, Stanley Slide, *P.* 17924 (1920); Crawford Purchase, *P.* 11192 (1908); Low & Burbank Grant, Outview Fall, *P.* 436 (1901), King Ravine, *P.* 10656 (1907), Knife Edge, *P.* 10772 (1907), Madison Huts, *P.* 10215 = *M.* 3346 (1907); Sargent Purchase, Tuckerman Ravine, *W. F. Flint* (1871); Cutts Grant, Oakes Gulf, *Williams* (1893, 1898), *J. M. Greenman* (1898); Hadley Grant, Mt. Crawford, *P.* 11779 (1908).

Alnus incana (L.) Moench, var. **glauca** Ait. (*Rhod.* 16 (1914), 56). Speckled Alder. Swamps, common.—Pittsburg, near Third Lake, *M.* 3428 = *P.* 10297 (1907); Dartmouth College Grant, *P.* 16162 (1914); (Stewartstown); Colebrook, *M.* 3897 (1907), *P.* 13986 (1912); (Columbia); Cambridge, *P.* 18150 (1921); (Stratford); (Dummer); (Stark); Northumberland, *P.* 16451 (1917); (Milan); (Success); (Berlin); (Lancaster); (Dalton); Whitefield, *Deane* (1896, 1897); Jefferson, *P.* 17506 (1919); Randolph, *P.* 11179 (1908); (Gorham); Shelburne, *Deane* (1883), *P.*

11133 (1908); (Carroll); Crawford Purchase, *P.* 11257 (1908); (Low & Burbank Grant); (Pinkham Grant).

FAGACEAE (BEECH FAMILY).

FAGUS [Tourn.] L. Beech.

Fagus grandifolia Ehrh. Woods, common, especially southward; rarely above 2400 ft.—Pittsburg, First Lake, *Mrs. A. F. Stevens* (1895), *P.* 10137 = *M.* 3621 (1907); (Millsfield); (Stark); (Northumberland); (Success); (Berlin); Lancaster, *Deane* (1896); (Dalton); Whitefield, *Deane* (1895); (Carroll); Jefferson, *P.* 16497 (1915); Randolph, *M.* 1426 (1903), *Mrs. G. F. Moore* (1905), *M.* 4046, *P.* 10850 (1907); (Gorham); Shelburne, *Deane* (1883, 1909); (Pinkham Grant).

QUERCUS [Tourn.] L. Oak.

Quercus borealis Michx. f. (*Q. rubra Man.*, not L.; *cf. Rhod.* 18 (1916), 46–48). Gray Oak. Frequent or common in the lower and warmer towns, absent at higher levels (for example, common in Gorham, entirely absent from Randolph). On Mt. Hayes this tree ascends to about 2500 ft., but it is usually not abundant above 1500 ft.—Errol, Lake Umbagog, *P.* 10508 (1907); Berlin, Mt. Forist, *P.* 16112 (1914); Gorham, *L. M. Watson* (1895), *P.* 10521 (1907), *M.* 4175 (1908); Martin Location, *P.* 14289 (1913); Shelburne, *Deane* (1882, 1883, 1884), *P.* 11163 = *M.* 4134 (1908), *S. Wilson* (1913); Bean Purchase, Wild River valley, *P.* 16014 (1914); Lancaster, Mt. Prospect, *P.* 14231 (1913); Dalton, *P.* 11587 (1908), 16396 (1915); Hadley Grant, Mt. Hope, *ca.* 2300 ft., *P.* 16453 (1915).

URTICACEAE (NETTLE FAMILY).

ULMUS [Tourn.] L. Elm.

Ulmus americana L. American Elm. Alluvial soil and roadsides, common.—Pittsburg, west of Indian Stream, *P.* 10985 (1907); Dartmouth College Grant, *P.* 16204 (1914); (Stewartstown); (Colebrook); (Columbia); (Stratford); (Stark); (Northumberland); (Milan); (Berlin); (Lancaster); (Dalton); (Whitefield); (Carroll); (Jefferson); Randolph, *Williams* (1896, 1897), *P.* 4101 (1904), *M.* 4213 (1908); Gorham, *P.* 16007 (1914); Shelburne, *Deane* (1882, 1917).

HUMULUS L. Hop.

Humulus Lupulus L. Roadsides, etc., frequently escaped from cultivation.—Pittsburg, village, *P.* 10986 = *M.* 3728 (1907); Stewartstown, *F. & P.* 17007 (1917); Errol, dump, *M.* 3204 (1906); (Stratford); Lancaster, *P.* 12809 (1910); Dalton, *P.* 11586 = *M.* 4417 (1908); Whitefield, *P.* 14191 (1913); Jefferson, *P.* 10787 (1907); Randolph, *P.* 12840 (1910); Gorham, *Deane* (1883); Shelburne, *Mrs. E. S. Drown* (1916), *Deane* (1917); Martin Location, *P.* 12855 (1910).

URTICA [Tourn.] L. Nettle.

Urtica gracilis Ait. Waste ground, infrequent.—Colebrook, *P.* 10904 = *M.* 3952 (1907); Jefferson, *P.* 16704 (1916), 18220 (1921); Randolph, *P.* 18133 (1921).

Urtica Lyallii Wats. Rich woods, infrequent.—Stewartstown, *F. & P.* 16599 (1917); Millsfield, *P.* 18168 (1921); Jefferson, *P.* 18218 (1921).

LAPORTEA Gaud. Wood Nettle.

Laportea canadensis (L.) Gaud. Rich woods, occasional.—Clarksville, *P.* 11060 = *M.* 3705 (1907); (Stewartstown); Colebrook, *P.* 10424 = *M.* 3813 (1907); (Columbia); Millsfield, *P.* 18158 (1921); Cambridge, Lakeside, *Deane* (1916); (Stratford); Milan, Cedar Pond, *P.* 13869 (1912); Lancaster, Coös Junction, *P.* 12114 (1909), Mt. Prospect, *P.* 14547 (1913); Carroll, Crawford's, *C. Pickering* (1825); Jefferson, *P.* 16835 (1916); Randolph, *P.* 9920 (1906); Shelburne, *Deane* (1916).

PILEA Lindl. Richweed; Clearweed.

Pilea pumila (L.) Gray. Moist rich woods, occasional, mostly southward.—Lancaster, Mt. Tug, *P.* 16738 (1916), Mt. Prospect, *P.* 14512 (1913); Dalton, *P.* 17415 (1919); Jefferson, *P.* 10749 (1907); Randolph, *P.* 16811 (1915), 17376 (1918); Gorham, *P.* 12872 (1910); Shelburne, *Deane* (1917).

SANTALACEAE (SANDALWOOD FAMILY).

COMANDRA Nutt. Bastard Toad-flax.

Comandra livida Richards. Boggy mountain-tops, very local.—Success, Mt. Success, *P.* 11210 = *M.* 4096 (1908); Bean Purchase, near Imp Camp, 3600 ft., *P.* 16766 (1917); Bean Grant,

Mt. Clinton, *W. W. Eggleston & H. E. Sargent* (1901), *P.* 12303 (1909).

LORANTHACEAE (MISTLETOE FAMILY).

ARCEUTHOBIUM Bieb.

Arceuthobium pusillum Peck. DWARF MISTLETOE. Parasitic on spruces, probably not rare but often overlooked.—Errol, Long Pond, *F. & P.* 16991 (1917); Randolph, *M.* 143 (1901), *P.* 3141 (1903), abundant near Tama Fall, *P.* 18098 (1921); Low & Burbank Grant, Jefferson Notch Road, *P.* 16368 (1915), Gordon Ridge, 2500 ft., *P.* 6618, 6619 (1904); Shelburne, Minard's swamp, *W. G. Farlow* (1885, 1894); Bean Purchase, Moriah Brook Gorge, *P.* 16601 (1915).

ARISTOLOCHIACEAE (BIRTHWORT FAMILY).

ASARUM [Tourn.] L. WILD GINGER.

Asarum canadense L. Rich woods, Connecticut valley, frequent.—Colebrook, *P.* 10919 (1907), 12303 (1909); Columbia, *F. & P.* 16614 (1917); Stratford, *P.* 13489 (1912); Lancaster, *P.* 16424 (1915); Dalton, *P.* 11539 = *M.* 4380 (1908), *P.* 16419 (1915).

POLYGONACEAE (BUCKWHEAT FAMILY).

OXYRIA Hill. MOUNTAIN SORREL.

Oxyria digyna (L.) Hill. Alpine brooks, local.—Thompson & Meserve Purchase, Great Gulf, *E. & C. E. Faxon* (1878, 1887, 1892, 1896), *Williams* (1893, 1895), *J. R. Churchill* (1895), *P.* 12103 = *M.* 4259 (1909); Sargent Purchase, Tuckerman Ravine, *W. Boott* (1855), *E. Faxon* (1877), *W. H. Manning* (1881), *J. R. Churchill* (1889), *Williams* (1893), *E. D. Merrill* (1896), *W. W. Eggleston* (1899), *P.* 469 = *M.* 299 (1902); Mt. Washington, not definitely located, *J. A. Allen* (1878), *W. G. Farlow* (1884), *A. P. Chadbourne* (1884); alpine region, not definitely located *Oakes* (no date), *H. Mann* (1862), *C. G. Pringle* (1877, 1878).

RUMEX L. DOCK; SORREL.

RUMEX PATIENTIA L. PATIENCE DOCK. Fields, occasional.—(Stewartstown); Colebrook, *P.* 10422 = *M.* 3875 (1907); Jefferson, *P.* 16400 (1915); Randolph, *P.* 16089 (1914); Gorham, *P.* 14431 (1913); Shelburne, *Deane* (1919); Green Grant, *P* 17112 (1918).

Rumex Britannica L. Great Water Dock. Wet places, rare.—Stewartstown, *F. & P.* 17013 (1917); Milan, Upper Ammonoosuc River, *P.* 13962 (1912).

Rumex crispus L. (including *R. elongatus* Guss.). Yellow Dock. Cultivated and waste places, common.—Pittsburg, west of Indian Stream, *P.* 11064 = *M.* 3741 (1907); Stewartstown, *P.* 14022 (1912); Columbia, *P.* 14071 (1912); (Success); Lancaster, *P.* 12364 (1909), 14531 (1913); Jefferson, *P.* 12686 (1910), 14359 (1913), 16881 (1916); Randolph, *M.* 1134 (1903), *P.* 12068 (1909); Gorham, *P.* 12682 (1910), 16437 (1915); Shelburne, *Deane* (1908); (Pinkham Grant).

Rumex mexicanus Meisn. Logging roads, etc., occasional.—Stewartstown, *F. & P.* 16592 (1917); Milan, *P.* 13872 (1912); Randolph, near Pond of Safety, *P.* 12263 (1909); Berlin, Upper Ammonoosuc River, *P.* 13832 (1912), 16517 (1915), 17187 (1918); Gorham, *P.* 12682 (1910); Shelburne, oat-field, *Deane* (1915).

Rumex obtusifolius L. Bitter Dock. Fields and waste places, common.—Pittsburg, First Lake, *P.* 11004 = *M.* 3623 (1907); (Stewartstown); (Columbia); (Stratford); Milan, *P.* 13842 (1912); (Berlin); Jefferson, *P.* 14391 (1913); Randolph, *P.* 493 (1902), 5425 (1904); Shelburne, *Deane* (1915).

Rumex maritimus L., var. fueginus (Phil.) Dusén. (*R. persicarioides Man.* in part; *cf. Rhod.* **17** (1915), 81–82). Rare waif.—Randolph, railroad track at Bowman station, *P.* 17472 (1919); Gorham, old logging road south of Pine Mt., *P.* 14425 (1913).

Rumex Acetosella L. Sheep Sorrel. Fields and pastures, very common.—Pittsburg, First Lake, *P.* 10162 = *M.* 3660 (1907); (Stewartstown); Stratford, *P.* 12729 (1910), 13554 (1912); (Milan); (Success); (Berlin); (Lancaster); (Carroll); (Jefferson); Randolph, *M.* 213 (1902), 3376 (1907), *P.* 11241 (1908); (Gorham); Shelburne, *Deane* (1883, 1909, 1916); Martin Location, *P.* 14348 (1913); (Low & Burbank Grant); Thompson & Meserve Purchase, Carriage Road, 5000 ft., *Williams* (1897), *P.* 10544 (1907); Sargent Purchase, summit of Mt. Washington, *Williams* (1895); Cutts Grant, Mt. Franklin, 4800 ft., *P.* 16779 (1916); Bean Purchase, North Baldface Mt., *P.* 16047 (1914).

RHEUM L. RHUBARB.

RHEUM RHAPONTICUM L. Persistent about old cellar-holes.—Randolph, *P.* 5686 (1904), 10864 (1907), *M.* 3309 (1907); Shelburne, *Deane* (1919).

POLYGONUM [Tourn.] L. KNOTWEED.

POLYGONUM AVICULARE L. Common weed.—(Pittsburg); (Stewartstown); (Columbia); (Errol); (Stratford); Milan, *P.* 13772 (1912); Success, *P.* 10639 (1907); (Berlin); (Lancaster); Jefferson, *P.* 16843 (1916); Randolph, *M.* 1140, 1459 (1903), *P.* 11683 (1908), 17182 (1918); Gorham, *P.* 16084 (1914); Shelburne, *Deane* (1915).

POLYGONUM AVICULARE L., var. ANGUSTISSIMUM Meisn. Infrequent.—Shelburne, railroad track, *Deane* (1918).

POLYGONUM RAMOSISSIMUM Michx. Waste ground, rare.—Berlin, *P.* 16521, 16641 (1915).

Polygonum Douglasii Greene. Shaded ledges, very local.—Hadley Grant, Hart Ledge, *P.* 16622, 16624 (1915).

Polygonum viviparum L. Moist places in the alpine region, local.—Thompson & Meserve Purchase, head of the Great Gulf, *C. E. Faxon* (1885), *E. & C. E. Faxon, Williams* (1895); Sargent Purchase, Alpine Garden, *E. & C. E. Faxon* (1887, 1895), *Williams* (1893, 1897), *W. W. Eggleston* (1899), *P.* 489 = *M.* 280 (1902), *P.* 12529 (1909), Tuckerman Ravine, *G. G. Kennedy* (1891); Cutts Grant, Crawford Path, *J. R. Churchill, E. & C. E. Faxon* (1895), Oakes Gulf, *P.* 12029 (1909); Mt. Washington, not definitely located, *W. F. Flint & J. H. Huntington* (1876), *J. A. Allen* (1878); alpine region, not definitely located, *Oakes* (no date), *W. Boott* (1855), *H. Mann* (1862).

Polygonum lapathifolium L. Fields, etc., common.—(Pittsburg); Dartmouth College Grant, *P.* 16288 (1914); Stewartstown, *F. & P.* 17064 (1917); Whitefield, *P.* 17796 (1919); Randolph, *M.* 4458 (1908), 4591 (1909); Gorham, *P.* 18228 (1921); Shelburne, *Deane* (1885, 1914).

Polygonum lapathifolium L., var. **salicifolium** Sibthorp (not *P. tomentosum* Schrank, var. *incanum* Robinson & Fern.; *cf. Rhod.* 23 (1921), 259). Fields, frequent.—Milan, *P.* 17443

(1919); Berlin, *P.* 14448, 14494 (1913); Jefferson, *P.* 16898 (1916); Randolph, *P.* 16260 (1914), 17184 (1918); Gorham, *P.* 16542 (1915); Shelburne, *Deane* (1914, 1915, 1917, 1918).

Polygonum scabrum Moench (*P. tomentosum* Schrank; *cf. Rhod.* 23 (1921), 259). Fields, occasional.—Milan, *P.* 13827 (1912); Randolph, *P.* 13560 (1915); Whitefield, *Deane* (1895).

Polygonum amphibium L. Ponds, not common.—Columbia, Lime Pond, *P.* 10465 = *M.* 3837 (1907); Cambridge, Lake Umbagog, *P.* 16530 (1915), 18187 (1921).

Polygonum amphibium L., f. **terrestre** (Leers) Blake (*Rhod.* 15 (1913), 164). Very local.—Lancaster, Martin Meadow Pond, *P.* 16645 (1917), 17598 (1919), 17815 (1920).

Polygonum pensylvanicum L., var. **laevigatum** Fern. (*Rhod.* 19 (1917), 73). Fields and waste places, frequent.—Pittsburg, near Back Lake, *F.* & *P.* 17070 (1917); Stewartstown, *F.* & *P.* 17016 (1917); Berlin, Dead River, *P.* 17492 (1919), 17847 (1920), dwarf forms; Lancaster, *P.* 12361 (1909); Randolph, *M.* 4070 (1907); Shelburne, *P.* 11693 (1908), *Deane* (1915).

Polygonum Careyi Olney. Fields and roadsides, rare.—Pittsburg, near Back Lake, *F.* & *P.* 17069 (1917); Martin Location, *P.* 12854 (1910).

Polygonum Hydropiper L. Wet places, common.—Stratford, *P.* 17730 (1917), 17682 (1919); Jefferson, *P.* 16846 (1916); Randolph, *M.* 1458 (1903), *P.* 11682 (1908), 17613 (1919); Gorham, *P.* 11423 (1908), 16543 (1915), 16935 (1916); Shelburne, *Deane* (1913).

Polygonum acre HBK. (incl. var. *leptostachyum* Meisn.; *cf. Rhod.* 23 (1921), 260). Moist ground, probably not rare, but seldom collected.—(Pittsburg); Errol, *F.* & *P.* 16986 (1917); (Jefferson); Randolph, *P.* 17612 (1919); Shelburne, *Deane* (1913).

Polygonum Persicaria L. Lady's Thumb. Fields, etc., very common.—Milan, *P.* 13828 (1912); Jefferson, *P.* 16847 (1916); Randolph, *Williams* (1896), *M.* 356 (1902), 4075 (1907), 4592 (1909), *P.* 11698 (1908), 17602 (1919); Gorham, *Williams* (1895), *Mrs. G. F. Moore* (1903), *P.* 14424 (1913), 16915 (1916); Shelburne, *Deane* (1915).

Polygonum sagittatum L. Arrow-leaved Tear-thumb.—(Pittsburg); (Stewartstown); (Columbia); (Stark); (Northumberland); Milan, *P.* 13747 (1912); (Berlin); (Lancaster); Whitefield, *Deane* (1897), *M.* 4426 (1908); Jefferson, *P.* 16852 (1916); (Carroll); Randolph, *Williams* (1896), *M.* 249, 410 (1902), *P.* 11647 (1908), 12230 (1909); (Gorham); Shelburne, *Deane* (1882).

Polygonum Convolvulus L. Weed in waste places and fields, common.—Pittsburg, village, *M.* 3680 (1907); Colebrook, *P.* 10365 = *M.* 3934 (1907); (Columbia); (Errol); (Stratford); (Stark); (Berlin); Whitefield, *Deane* (1896); (Jefferson); Randolph, *Williams* (1896), *M.* 357 (1902), 4069 (1907), *P.* 11680 (1908); Gorham, *P.* 16919 (1916); Shelburne, *Deane* (1882, 1883), *M.* 4865 (1911); Sargent Purchase, summit of Mt. Washington, *Williams* (1901).

Polygonum cilinode Michx. (including var. *erectum* Peck). Gravelly and rocky soil, common.—Colebrook, *P.* 10391 = *M.* 3925 (1907); (Stark); Berlin, *P.* 16115 (1914); (Lancaster); Whitefield, *Deane* (1896); Carroll, Crawford's, *Miss S. Minns* (no date); Jefferson, *M.* 1370 (1903); Randolph, *Williams* (1896), *P.* 12072 (1909); Gorham, *M.* 4282 (1908), *P.* 13659 (1912); Shelburne, *Deane* (1882).

Polygonum scandens L. Damp thickets, etc., infrequent.—Shelburne, *Deane* (1915, 1918); Hadley Grant, Hart Ledge, *P.* 16623 (1915).

FAGOPYRUM [Tourn.] Hill. Buckwheat.

Fagopyrum esculentum Moench. Escaping from cultivation.—Pittsburg, *P.* 10418 = *M.* 3735 (1907); Whitefield, *Deane* (1895); Gorham, *M.* 4270, *P.* 11472 (1908); Shelburne, *Deane* (1883, 1916); Thompson & Meserve Purchase, Great Gulf, *P.* 12103 (1909).

Fagopyrum tataricum (L.) Gaertn. Escaping from cultivation.—Whitefield, *Deane* (1895, 1897); Jefferson, *P.* 10740 (1907); Shelburne, *Deane* (1883, 1914).

POLYGONELLA Michx.

Polygonella articulata (L.) Meisn. Becoming established in sandy soil along railroad tracks.—Northumberland, *F.* & *P.*

17032 (1917), *P.* 19092 (1922); Dalton, *P.* 16316 (1914); Jefferson, *P.* 16597 (1915); Carroll, Twin Mt., *P.* 14467 (1913), Crawford's, *P.* 11750 (1908); Randolph, *P.* 9921, *M.* 3213 (1906); Gorham, *P.* 12185 (1910).

CHENOPODIACEAE (GOOSEFOOT FAMILY).

BETA L. Beet.

Beta vulgaris L. Waste places, infrequent.—Jefferson, *P.* 11009 (1907).

CHENOPODIUM [Tourn.] L. Pigweed.

Chenopodium capitatum (L.) Asch. Strawberry Blite. Rare waif.—Stratford, railroad ballast, North Stratford, *S. N. F. Sanford* (1914).

Chenopodium glaucum L. Locally adventive.—Berlin, *P.* 11514 = *M.* 4484 (1908), *P.* 16441 (1915), 17483 (1919).

Chenopodium hybridum L. Rare.—Berlin, waste ground, *P.* 11632 (1908); Lancaster, Mt. Prospect, perhaps indigenous, *P.* 14581 (1913), 17227 (1918).

Chenopodium album L. Waste places, especially in rich soil, common.—(Pittsburg); Stewartstown, *M.* 3779 (1907); (Columbia); (Stratford); (Stark); (Northumberland); (Milan); (Success); (Berlin); (Lancaster); (Jefferson); Randolph, *P.* 499 (1902), *M.* 1379 (1903), *P.* 11686 (1908), 17176, 17323 (1918), 17471 (1919); (Gorham); Shelburne, *Deane* (1882, 1917).

Chenopodium album L., var. viride (L.) Moq. Common with the typical form.—(Pittsburg); (Errol); Randolph, *M.* 4066 (1907), *P.* 12182 (1909); Shelburne, *Deane* (1915); Martin Location, *P.* 17216 (1918).

Chenopodium paganum Reichenb. (*cf.* Standley in *N. A. Fl.* 21, 1 (1916), 23). Infrequently adventive.—Stewartstown, roadsides near West Stewartstown, *F. & P.* 17065 (1917).

Chenopodium urbicum L. Barnyards, infrequent.—Milan, *P.* 13689 (1912); Jefferson, *P.* 16936 (1916).

Chenopodium Boscianum Moq. Shaded ledges, rare.—Hadley Grant, Hart Ledge, *P.* 16627 (1915).

CHENOPODIUM LEPTOPHYLLUM Nutt., var. OBLONGIFOLIUM Wats. Infrequent waif.—Gorham, *P.* 12156 (1909); Shelburne, railroad track, *Deane* (1917).

ATRIPLEX [Tourn.] L. ORACH.

ATRIPLEX PATULA L. Waste ground, infrequent.—Milan, West Milan village, *P.* 13953 (1912); Gorham, *P.* 14456 (1913), 16104 (1914).

SALSOLA L. SALTWORT.

SALSOLA KALI TENUIFOLIA L., var. G. F. W. Mey. Railroad ballast, etc., infrequent.—Berlin, *P.* 11789 = *M.* 4304 (1908), near Head Pond, *P.* 14500 (1913); Gorham, *P.* 16326 (1914).

AMARANTHACEAE (AMARANTH FAMILY).

AMARANTHUS [Tourn.] L. AMARANTH.

AMARANTHUS RETROFLEXUS L. Cultivated and waste places, common.—(Pittsburg); (Colebrook); (Columbia); (Berlin); Randolph, *P.* 508 (1902), *M.* 355 (1902); Gorham, *M.* 4293 (1908), *P.* 16604 (1915); Shelburne, *Deane* (1915).

AMARANTHUS HYBRIDUS L., f. HYPOCHONDRIACUS (L.) Robinson. Garden weed.—Whitefield, *M.* 4351 (1908); Shelburne, *Deane* (1915).

AMARANTHUS GRAECIZANS L. Waste ground, occasional.—(Colebrook); Stratford, *F. & P.* 17029 (1917); Milan, *P.* 13949 (1912); Berlin, *P.* 10678 (1907), *M.* 4307 (1908); Dalton, *P.* 11418 = *M.* 4360 (1908); Whitefield, *M.* 4348 (1908); Gorham, *M.* 4269 (1908), *P.* 11475 (1908); Shelburne, *Deane* (1917).

ILLECEBRACEAE (KNOTWORT FAMILY).

PARONYCHIA [Tourn.] Adans. WHITLOW-WORT.

Paronychia argyrocoma (Michx.) Nutt., var. **albimontana** Fern. Bare mountain ledges, local.—Sargent Purchase, (Boott Spur, according to *Dr. H. St. John*), between Mts. Resolution and Crawford, *P.* 14040 (1912); Bean Grant, slide on Mt. Clinton, *E. Tuckerman* (no date), the type specimen; *cf. M. L. Fernald* in *Rhod.* 8 (1906), 104; Hadley Grant, Mt. Crawford, *P.* 11707 (1908); Mt. Washington, not definitely located, *W. F. Flint & J. H. Huntington* (1876); (Bean Purchase, Carter Notch, 1894, according to *Mrs. A. D. Wilde, Plants of Mt. Washington, N. H.*

(1920), 3).—Oakes (in *Hovey's Mag. of Hort.* 13 (1847), 217) says this plant was probably first collected in the Notch in 1843 by Drs. Chapman and Alexander; Tuckerman later got it on Mt. Crawford.

AIZOACEAE.

MOLLUGO L. Carpet Weed.

Mollugo verticillata L. Railroad tracks, frequent.—(Colebrook); (Columbia); Milan, West Milan, *P.* 13950 (1912); Berlin, *P.* 11306, *M.* 4473 (1908); Whitefield, *P.* 11573 = *M.* 4418 (1908); Jefferson, *M.* 1371 (1903), *P.* 10799 (1907); Carroll, *P.* 12695 (1910); Randolph, *P.* 12776 (1910); Gorham, *P.* 11474 (1908); Shelburne, *Deane* (1917).

CARYOPHYLLACEAE (PINK FAMILY).

SPERGULARIA J. & C. Presl. Sand Spurrey.

Spergularia rubra (L.) J. & C. Presl. Railroad tracks, occasional.—Columbia, *P.* 17698 (1919); Lancaster, *P.* 12146 (1909); Whitefield, *P.* 11617 = *M.* 4354 (1908); Jefferson, *P.* 12803 (1910); Carroll, *P.* 12696 (1910), Twin Mt., *P.* 16650 (1916).

SPERGULA L. Spurrey.

Spergula arvensis L. Grain-fields and roadsides, common.—Pittsburg, near Canaan line, *P.* 11054 = *M.* 3745 (1907); (Stewartstown); Colebrook, *P.* 10902 = *M.* 4004 (1907); (Columbia); (Millsfield); (Errol); Cambridge, *P.* 18185 (1921); Dummer, *Williams* (1895); (Berlin); Whitefield, *Deane* (1896); Jefferson, *P.* 16875 (1916); Randolph, *P.* 535 (1900), *M.* 223 (1902), 4072 (1907), 4595 (1909); Shelburne, *Deane* (1915).

SAGINA L. Pearlwort.

Sagina procumbens L. Rare.—Randolph, in tubs of laurel trees at Ravine House, *P.* 17331 (1918).

ARENARIA L. Sandwort.

Arenaria lateriflora L. (*Rhod.* 19 (1917), 260–261). Moist open places, frequent.—Pittsburg, near Indian Stream, *P.* 11025 = *M.* 3774 (1907); Wentworth Location, *P.* 12583 (1910); Stewartstown, *P.* 10975 = *M.* 3685 (1907); (Colebrook); Columbia, *F.* & *P.* 16790 (1917); Errol, *P.* 12617 (1910); Stratford, *P.* 13456

(1912); Northumberland, *P.* 13453 (1912), *F. & P.* 16787 (1917); Lancaster, *P.* 12282 (1909); Jefferson, *P.* 16510 (1917); Randolph, *P.* 14116 (1913); Shelburne, *Deane* (1915, 1916); Green Grant, logging roads, *P.* 13665 (1912).

Arenaria stricta Michx. Very local.—Hadley Grant, Hart Ledge, *P.* 16613, 16619 (1915). The report of this species from Mt. Washington by *W. H. Manning* (1881) rested upon a confusion; *cf.* Fernald in *Rhodora*, 11 (1909), 184.

Arenaria groenlandica (Retz.) Spreng. Alpine Sandwort. Gravelly and stony mountain-tops, common in the alpine region.—Success, Mt. Success, *P.* 11312 = *M.* 4100 (1908); Shelburne, Shelburne Moriah. *Miss M. Church* (1914); Low & Burbank Grant, Knife Edge, *P.* 10838 (1907), 12191 (1909), King Ravine, 2900 ft., *P.* 518 (1902), Nowell Ridge, *P.* 9893 (1906); Thompson & Meserve Purchase, Mt. Madison, *J. R. Churchill* (1889), Madison Hut, *M.* 139 (1901), Parapet, *P.* 16491 (1915), Edmands Col, *P.* 4097 (1904), *M.* 4605 (1909), Mt. Jefferson, *E. & C. E. Faxon* (1885), Great Gulf, *Williams* (1895), Carriage Road, *Deane* (1882, 1884), *Williams* (1893, 1897); Sargent Purchase, summit of Mt. Washington, *A. P. Garber* (1874), *Deane* (1882), *Mrs. A. T. Slosson* (1888), *H. H. Taylor* (1895), *E. D. Merrill* (1896), *Rev. C. Hall* (no date), Alpine Garden, *E. & C. E. Faxon* (1885), *P.* 10555 (1907), Bigelow Lawn, *E. & C. E. Faxon, Williams* (1885); Mt. Washington, not definitely located, *W. F. Flint & J. H. Huntington* (1876), *J. A. Allen* (1880), *C. H. Hitchcock, R. Rounds* (1883), *G. M. Sanger* (1886), *Williams & B. L. Robinson* (1903); Cutts Grant, Mt. Monroe, *J. M. Greenman* (1898), *M.* 4575 (1909); Bean Grant, Mt. Jackson, *P.* 12300 (1909); alpine region, not definitely located, *Oakes* (no date), *H. Mann* (1862).

Arenaria groenlandica (Retz.) Spreng., var. **glabra** (Michx.) Fern. (*Rhod.* 21 (1919), 20). Rare.—Hadley Grant, Mt. Hope, *P.* 16463, 16464 (1915).

STELLARIA L. Chickweed.

Stellaria borealis Bigel. (including vars. *isophylla* Fern. and *floribunda* Fern.). Cool rills, frequent, especially in alpine regions.—Pittsburg, Second Lake, *P.* 10318 = *M.* 3526 (1907), First Lake, *P.* 10130 = *M.* 3598 (1907); Stewartstown, *F. & P.*

16786 (1919); Colebrook, *P.* 10917 (1907); Stratford, *P.* 13463 (1912); Stark, Devil's Hop Yard, *P.* 16752 (1916); Milan, *P.* 13851 (1912); Success, *P.* 16809 (1917); Dalton, *P.* 16392 (1915); Jefferson, *P.* 12698 (1910); Randolph, *Williams* (1896), *P.* 541 (1900), Ice Gulch, *J. R. Churchill* (1890), *Williams* (1895); Gorham, *P.* 16679 (1916); Green Grant, *E. & C. E. Faxon* (1896); Low & Burbank Grant, Valleyway, *P.* 16487 (1915), near Madison Hut, *J. R. Churchill* (1889), *M.* 271 (1902); Thompson & Meserve Purchase, Great Gulf, *E. & C. E. Faxon* (1879); Sargent Purchase, summit of Mt. Washington, *E. & C. E. Faxon* (1893), *Williams* (1893), *Deane* (1894), *J. Robinson*, *M.* 128 (1901), Alpine Garden, *J. R. Churchill*, *E. & C. E. Faxon* (1895) *P.* 10557 (1907), Huntington Ravine, *P.* 16317 (1914), *F. & P.* 16865 (1917); Mt. Washington, not definitely located, *C. E. Faxon* (1878), *E. Faxon* (1894); alpine region, not definitely located, *Oakes* (no date), *J. W. Chickering* (1877).

Stellaria uliginosa Murr. Rills, frequent in the calcareous area, rare elsewhere.—Clarksville, *P.* 10987 = *M.* 3772, 3773 (1907), *P.* 17693 (1919); Stewartstown, *P.* 10406 = *M.* 3960 (1907), *F. & P.* 16569, 16637 (1917), Little Diamond Pond, *P.* 12629 (1910); Columbia, *P.* 17708 (1919); Northumberland, Lost Nation, *P.* 16731 (1916).

Stellaria longifolia Muhl. Grassy places, occasional.—Stewartstown, *F. & P.* 16799 (1917); Northumberland, *F. & P.* 16788 (1917); Randolph, *J. R. Churchill* (1889), *M.* 1126 (1903), *P.* 12064 (1909); Green Grant, *P.* 13625 (1912).

Stellaria graminea L. Grassy places, frequent; often introduced in feed.—Dartmouth College Grant, *P.* 16271 (1914); Colebrook, *P.* 12585 (1910); (Columbia); (Success); Berlin, *P.* 11627 = *M.* 4474 (1908); Lancaster, *P.* 14179 (1913); Jefferson, *P.* 16380 (1915); Randolph, *P.* 16354 (1915); Gorham, *P.* 12677 (1910); Shelburne, *Deane* (1918); Carroll, *P.* 12203 (1909), Crawford's, *E. & C. E. Faxon* (1886), *Williams* (1898); Crawford Purchase, *P.* 12204 (1909).

Stellaria media (L.) Cyrill. Common Chickweed. Maple groves and cultivated ground, common.—Pittsburg, village, *M.* 3677 (1907); (Clarksville); (Columbia); (Stark); (Success);

(Berlin); Lancaster, *P.* 14221 (1913); Jefferson, *P.* 14389 (1913); (Carroll); Randolph, *Williams* (1897), *P.* 10524 (1907), *M.* 4179 (1908); (Gorham); Shelburne, *Deane* (1915); Sargent Purchase, summit of Mt. Washington, *Williams* (1903).

CERASTIUM L. Mouse-ear Chickweed.

Cerastium vulgatum L., var. hirsutum Fries (*Rhod.* 22 (1920), 178). Gardens, fields, etc., common.—Pittsburg, Second Lake, *P.* 10317 = *M.* 3524 (1907); (Stewartstown); (Columbia); (Millsfield); Stratford, *P.* 13526 (1912); Milan, *P.* 13811 (1912); (Success); (Jefferson); (Carroll); Randolph, *M.* 957, 1094 (1903), *P.* 11223 (1908); (Gorham); Shelburne, *Deane* (1881, 1916); Martin Location, *P.* 14309 (1913); Sargent Purchase, summit of Mt. Washington, *Williams* (1901).

AGROSTEMMA L. Corn Cockle.

Agrostemma Githago L. Grain-fields, occasional, becoming less frequent.—Stewartstown, *P.* 14015 (1912); Milan, *P.* 15769 (1912); Berlin, *P.* 11640 (1908); Whitefield, *P.* 11450 (1908); Randolph, *Williams*, *C. A. L. Richards* (1897), *P.* 522 (1901), 10708 (1907), 11737 (1908), *M.* 4459 (1908), 4590 (1909), *P.* 19095 (1922); Gorham, *J. J. Greenough* (1883), *P.* 12675 (1910); Shelburne, *P.* 11675 (1908), *Deane* (1918).

LYCHNIS [Tourn.] L. Campion.

Lychnis chalcedonica L.—Millsfield, *P.* 18097 (collected in Randolph (1921) from a plant transplanted from Millsfield by V. D. Lowe); Dalton, *Deane* (1894); Jefferson, *P.* 19058 (1922).

Lychnis dioica L., white-flowered form. Rare.—Lancaster, *P.* 16398 (1915).

Lychnis alba Mill. Rarely adventive.—Jefferson, Starr King, *Mrs. E. H. Terry*, according to B. L. Robinson in *Rhod.* 5 (1903), 235.

SILENE L. Catchfly.

Silene antirrhina L. Sleepy Catchfly. Very locally indigenous on shaded ledges, occasionally adventive in gravelly places.—Berlin, *P.* 11626 = *M.* 4501 (1908); Jefferson, Jefferson Junction, *P.* 16374 (1915); Hadley Grant, Hart Ledge, the only County station where it is indigenous, *P.* 16616 (1915).

Silene gallica L. Garden weed.—Shelburne, *Deane* (1916).

Silene noctiflora L. Night-flowering Catchfly. Occasional in fields and waste ground.—Stewartstown, *M.* 3780 (1907); Errol, *P.* 12613 (1910); Milan, *P.* 13740 (1912); Berlin, *M.* 4489 (1908); Lancaster, *P.* 12819 (1910); Carroll, *P.* 12251 (1909), 17432 (1919); Jefferson, *P.* 19056 (1922); Randolph, *P.* 12678 (1910); Gorham, *Williams* (1903), *P.* 10727 (1907), 11759 = *M.* 4327 (1908); Shelburne, *Deane* (1917).

Silene latifolia (Mill.) Britten & Rendle. Bladder Campion. Occasionally adventive.—Pittsburg, near Indian Stream, *P.* 10429 = *M.* 3681 (1907); (Clarksville); (Stewartstown); Colebrook, *P.* 10374 = *M.* 3907 (1907); Northumberland, *P.* 16062 (1914); Milan, *P.* 13723 (1912); Berlin, *P.* 11635 = *M.* 4495 (1908); Gorham, *M.* 4265, *P.* 11488 (1908); Shelburne, *Deane* (1917).

Silene acaulis L., var. **exscapa** (Allioni) DC. (*Rhod.* 23 (1921), 120). Moss Campion. Alpine barrens, local.—Thompson & Meserve Purchase, Cow Pasture, *E. & C. E. Faxon* (1890), *Williams* (1897, 1901), *W. W. Eggleston* (1901), *P.* 10546 (1907), Great Gulf, *G. G. Kennedy, Williams* (1895); Sargent Purchase, Alpine Garden, *Williams* (1898), *P.* 10553 (1907), half-mile below summit of Mt. Washington, *A. P. Chadbourne* (1884); Mt. Washington, not definitely located, *W. F. Flint & J. H. Huntington* (1876), *E. & C. E. Faxon* (1877, 1878, 1880), *J. R. Churchill* (1895), *J. M. Greenman* (1898); alpine region, not definitely located, *Oakes* (no date), *H. Mann, J. Blake* (1862), *J. W. Chickering* (1874), *G. L. Goodale* (no date).

SAPONARIA L.

Saponaria officinalis L. Bouncing Bet. Escape.—(Stark); (Northumberland); Gorham, *P.* 14429 (1913); Martin Location, *P.* 12922 (1910); Shelburne, *Deane* (1916).

Saponaria Vaccaria L. Cow Herb. Rare waif.—Jefferson, Cherry Mt. station, *P.* 16639 (1915); Martin Location, *P.* 17212 (1918).

GYPSOPHILA L.

Gypsophila elegans M. & B. Rare escape.—Randolph, waste-heap, *P.* 12020 (1909).

Gypsophila muralis L. Occasional escape.—Whitefield, garden weed, *Deane* (1897); Jefferson, Cherry Mt. station, *P.* 16610 (1915); Shelburne, *Deane* (1915).

DIANTHUS L. Pink; Carnation.

Dianthus atrorubens Allioni. Rare.—Shelburne, grass-land, *Deane* (1914).

Dianthus deltoides L. Maiden Pink. Rare.—Clarksville, roadside, *P.* 11039 = *M.* 3703 (1907).

PORTULACACEAE (PURSLANE FAMILY).

MONTIA [Mich.] L.

Montia perfoliata (Donn) Howell.—Jefferson, garden weed at Highlands, *G. B. Wellman* (1915).

CLAYTONIA [Gronov.] L. Spring Beauty.

Claytonia caroliniana Michx. Rich woods, frequent.—Pittsburg, Second Lake, *P.* 10250 = *M.* 3436 (1907); Stratford, Sugarloaf Mt., *P.* 13445 (1912); Randolph, *Mrs. G. F. Moore* (1905), *P.* 10232 = *M.* 3310 (1907), Mt. Randolph, *P.* 16465 (1917); Shelburne, *Deane* (1909); Low & Burbank Grant, Valleyway, 4200 ft., *P.* 16486 (1917), Durand Ridge, *P.* 514 (1901); Cutts Grant, Oakes Gulf, above tree-line, *Williams* (1893, 1898), *J. M. Greenman* (1898), *P.* 11140 (1908).

PORTULACA [Tourn.] L. Purslane.

Portulaca oleracea L. Garden weed, not very common.—Milan, *P.* 13688 (1912); Berlin, *P.* 11509 = *M.* 4504 (1908); Jefferson, *P.* 13031 (1910); Randolph, *P.* 12001½ (1909); Gorham, *P.* 11421, *M.* 4469 (1908); Shelburne, *Deane* (1908, 1917); (Martin Location).

NYMPHAEACEAE (WATER LILY FAMILY).

NYMPHOZANTHUS L. C. Richard. Pond Lily.

Nymphozanthus variegatus (Engelm.) Fern. (*Nymphaea advena* (Ait.) Fern., var. *variegata* (Engelm.) Fern.; *cf. Rhod.* 21 (1919), 187). Ponds and slow streams, common.—Pittsburg, Mud Pond and First Lake, *W. C. Kendall, E. L. Goldsborough,*

& A. Doolittle (1904); (Stewartstown); (Columbia); Cambridge, Lake Umbagog, *P.* 16570 (1915); (Stratford); Success, Success Pond, *P.* 16558 (1917); Dalton, Forest Lake, *P.* 17584 (1919); Whitefield, *Deane* (1896); Carroll, Ammonoosuc Lake, *Williams* (1898); Randolph, Pond of Safety, *M.* 1133 (1903), *P.* 5410 (1904), 10352 = *M.* 3307 (1907); Shelburne, *Deane* (1883, 1915, 1917).

Nymphozanthus rubrodiscus (Morong) Fern. (*Nymphaea rubrodisca* (Morong) Greene; *cf. Rhod. l.c.*). Ponds, frequent.—Dartmouth College Grant, Magalloway River, *P.* 16158 (1914); Columbia, Lime Pond, *P.* 10824 = *M.* 3885 (1907); Berlin, York Pond, *P.* 17165 (1918); Jefferson, Cherry Pond, *P.* 10654 (1907); Randolph, Pond of Safety, *P.* 11110 = *M.* 3306 (1907).

Nymphozanthus microphyllus (Pers.) Fern. (*Nymphaea microphylla* Pers.; *cf. Rhod.* 21 (1919), 186). Ponds and slow streams, occasional.—Pittsburg, Second Lake, *W. C. Kendall, E. L. Goldsborough, & A. Doolittle* (1904); Wentworth Location, Magalloway River, *P.* 10622 (1907); Stewartstown, *F. & P.* 17067 (1917); Jefferson, Cherry Pond, *P.* 10682 (1907); Shelburne, Gates Creek, *J. J. Greenough* (1882).

NYMPHAEA L. Water Lily.

Nymphaea odorata Ait. (*Castalia odorata* (Ait.) Woodville & Wood; *cf. Rhod.* 21 (1919), 183–184). Ponds, frequent.—Errol, Magalloway River, *P.* 10564 (1907), Lake Umbagog, *O. A. Lothrop* (1920); Cambridge, *P.* 16546 (1915); Milan, Mud Pond, *P.* 13691 (1912); Whitefield, Burns Pond, *P.* 14555 = *M.* 5051 (1913); Jefferson, Cherry Pond, *P.* 10689 (1907).

Nymphaea odorata Ait., var. **rosea** Pursh (*Castalia odorata* (Ait.) Woodville & Wood, f. *rosea* (Pursh) Britton; *cf. Rhod.* 23 (1921), 162). Ponds, occasional.—Whitefield, *Deane* (1896); Shelburne, Wheeler Pond, *Deane* (1917), Moose Pond, *Deane* (1917).

BRASENIA Schreb. Water Shield.

Brasenia Schreberi Gmel. Ponds, occasional.—Success, Success Pond, *P.* 16557 (1917); (Lancaster, Baker Pond); Jefferson, Cherry Pond, *P.* 10669 (1907); Whitefield, Burns Pond, *P.* 14580 = *M.* 5031 (1913).

RANUNCULACEAE (CROWFOOT FAMILY).

RANUNCULUS [Tourn.] L. Crowfoot; Buttercup.

Ranunculus aquatilis L., var. **capillaceus** DC. White Water Crowfoot. Rare.—Pittsburg, Mud Pond, *W. C. Kendall, E. L. Goldsborough, & A. Doolittle* (1904).

Ranunculus reptans L. (*R. Flammula* L., var. *reptans* (L.) Mey.; *cf. Rhod.* 19 (1917), 135–136). Wet sandy and gravelly shores, occasional.—Pittsburg, First Lake, *P.* 10198 = *M.* 3583 (1907); (Errol); Cambridge, Lake Umbagog, *P.* 17545 (1919); Stark, *P.* 17490 (1919); Northumberland, *P.* 12175 (1909); Lancaster, *P.* 12268 (1909); Dalton, *M.* 4373 (1908), Forest Lake, *P.* 17576 (1919); Whitefield, Burns Pond, *P.* 17792 (1919); Shelburne, *Deane* (1882).

Ranunculus abortivus L. Small-flowered Crowfoot. Woods, frequent.—Pittsburg, First Lake, *P.* 10293 = *M.* 3589 (1907); Dartmouth College Grant, *P.* 16232 (1914); Clarksville, *P.* 11013 = *M.* 3706 (1907); Stewartstown, *P.* 10355, *M.* 3946 (1907); (Columbia); Stratford, *P.* 13535 (1912); Milan, *P.* 13797 (1912); (Success); Jefferson, *P.* 16457 (1917); Carroll, Bretton Woods, *P.* 11269 (1908); Randolph, *M.* 978 (1903), *P.* 12031 (1909); Shelburne, *Deane* (1910, 1917); Low & Burbank Grant, Valleyway, *P.* 16486 (1915); Thompson & Meserve Purchase, Great Gulf, *E. & C. E. Faxon* (1895); Sargent Purchase, Tuckerman Ravine, *E. & C. E. Faxon* (1887), *P.* 12047 (1909); Bean Grant, Mt. Clinton, *M.* 1084 (1903).

Ranunculus abortivus L., var. **eucyclus** Fern. Rich woods, occasional.—Colebrook, *P.* 11043 = *M.* 3808 (1907); (Columbia); Errol, *P.* 12642 (1910); Stark, Devil's Slide, *P.* 17487 (1919); Berlin, *P.* 16119 (1914); Randolph, *P.* 12759 (1910); Carroll, Ammonoosuc Lake, *J. M. Greenman* (1898).

Ranunculus recurvatus Poir. Hooked Crowfoot. Rich woods, frequent.—Pittsburg, near Third Lake, *P.* 10330 (1907), First Lake, *P.* 10103 = *M.* 3633 (1907); Stewartstown, *P.* 10256 (1907); (Millsfield); Errol, *P.* 12645 (1910); Stratford, *P.* 13598 (1912); Milan, *P.* 13796 (1912); Lancaster, *P.* 14203 (1913), 17821 (1920); Dalton, *P.* 16417 (1915); Carroll, Twin Mt., *P.*

16656 (1916); Jefferson, *P.* 11089 (1907); Randolph, *P.* 580 (1901); Shelburne, *Deane* (1883).

Ranunculus septentrionalis Poir. Swamp Buttercup. Alluvial woods, frequent, especially northward.—Pittsburg, Third Lake, *P.* 10338, *M.* 3493 (1907), Second Lake, *P.* 10251 = *M.* 3452 (1907), First Lake, *P.* 10159 = *M.* 3565 (1907); Atkinson & Gilmanton Academy Grant, Hellgate, *P.* 12595 (1910); Stewartstown, *P.* 10255 = *M.* 3414 (1907); Colebrook, *P.* 10385 = *M.* 3947 (1907), *F. & P.* 16566 (1917); Stratford, *P.* 13634 (1912); Northumberland, *P.* 13581 (1912); Stark, Percy, *P.* 14150 (1913); Lancaster, *P.* 12153 (1910); Jefferson, *P.* 16489 (1917).

Ranunculus repens L. (*cf. Rhod.* 21 (1919), 169). Creeping Buttercup. Rarely adventive.—Low & Burbank Grant, logging road near Castles Brook, introduced in feed, *P.* 16724 (1916).

Ranunculus pennsylvanicus L. f. Bristly Crowfoot. Wet places, frequent.—(Stewartstown); Northumberland, *J. W. Robbins* (no date); Dummer, *Williams* (1895); Milan, *P.* 13597 (1912); Berlin, *P.* 17494 (1919), 17848 (1920); Dalton, *P.* 11600 (1908); Jefferson, *P.* 12802 (1910); Randolph, *Williams* (1895), *P.* 576 (1901), *M.* 4049 (1907); Shelburne, *Deane* (1882, 1914, 1916), *P.* 11168 (1908).

Ranunculus acris L. (including var. *Steveni* (Andrz.) Lange). Tall Buttercup. Fields, very common.—Pittsburg, First Lake, *P.* 10097 = *M.* 3560 (1907), *M.* 3652 (1907); (Stewartstown); (Colebrook); (Columbia); (Stratford); (Dummer); (Stark); (Northumberland); (Milan); (Success); (Berlin); (Lancaster); (Dalton); Whitefield, *Deane* (1897), *M.* 4357 (1908); (Carroll); Jefferson, *Mrs. E. H. Terry* (1899); Randolph, *M.* 238 (1902), *P.* 10013 = *M.* 3294, 3260 (1907), *P.* 17729 (1919); (Gorham); Shelburne, *Deane* (1915, 1916); Martin Location, *P.* 14291 (1913); (Pinkham Grant); (Low & Burbank Grant); Sargent Purchase, summit of Mt. Washington, *Williams*, *B. L. Robinson* (1901).

THALICTRUM [Tourn.] L. Meadow Rue.

Thalictrum polygamum Muhl. (including var. *hebecarpum* Fern.). Tall Meadow Rue. Our material usually has pubescent achenes, but is connected by an apparently unbroken series

with smooth-achened forms). Wet meadows, common.—Pittsburg, *P.* 17690 (1919); Clarksville, *F. & P.* 16940 (1917); Dartmouth College Grant, *P.* 16197 (1914); Colebrook, *P.* 10899 = *M.* 4032 (1907); Stratford, *P.* 17664 (1919); (Stark); Milan, *P.* 13749 (1912); Lancaster, *S. N. F. Sanford* (1914); (Dalton); (Jefferson); Carroll, Cherry Mt. Road, *E. & C. E. Faxon* (1891), Crawford's, *Williams* (1895), *J. M. Greenman* (1898); Crawford Purchase, *E. & C. E. Faxon* (1891); Jefferson, *P.* 10635 (1907); Randolph, *Williams* (1897), *M.* 200, 201 (1902), *P.* 10833 (1907), 16721 (1917); Shelburne, *Deane* (1882, 1915, 1918); (Low & Burbank Grant); Sargent Purchase, Tuckerman Ravine, *P.* 11506 (1908); Cutts Grant, Oakes Gulf, *Williams* (1895); (Pinkham Grant); Bean Purchase, *M.* 5077 (1913), Carter Notch, *M.* 1475 (1903). Forms with reddish or purplish flowers are: Carroll, Crawford's, *E. & C. E. Faxon* (1878); Randolph, *M.* 4231 (1908), *P.* 16070 (1914).

HEPATICA [Rupp.] Hill. Liverleaf; Hepatica.

Hepatica americana (DC.) Ker. (*H. triloba* Am. auth.; *cf. Rhod.* 19 (1917), 45). Rich woods, local.—Lancaster, Mt. Prospect, *P.* 14443 (1913), *S. N. F. Sanford* (1914), Mt. Pleasant, *P.* 14517 (1913), north of Martin Meadow Pond, *P.* 17820 (1920).

Hepatica acutiloba DC. Rocky woods, very local.—Lancaster, Mt. Prospect, *P.* 14223 (1913).

ANEMONE [Tourn.] L. Wind Flower; Anemone.

Anemone virginiana L. Dryish woods and roadsides, occasional.—Clarksville, *P.* 17674 (1919); Lancaster, *P.* 14198 (1913); Jefferson, *P.* 14459 (1913), 16421 (1915); Carroll, *P.* 16579 (1915); Gorham, *P.* 11662 (1908); Shelburne, *Deane* (1883), *P.* 11667 (1908).

Anemone quinquefolia L. Wood Anemone. Woods, especially in sandy alluvium, frequent.—Dartmouth College Grant, *P.* 12604 (1910), 16229 (1914); Errol, *P.* 12646 (1910); Colebrook, *P.* 10918 (1907); Stratford, *P.* 13461 (1912); (Stark); (Northumberland); Jefferson, *P.* 16512 (1917); Randolph, *P.* 11282 (1908), 16433 (1917); Shelburne, *Miss R. K. Stowell* (1916), *Deane* (1919).

CLEMATIS L. Virgin's Bower.

Clematis virginiana L. Alluvial soil, hedgerows, etc., common.—Pittsburg, *M.* 3519 (1907); Dartmouth College Grant, *P.* 16193 (1914); (Stewartstown); (Colebrook); (Columbia); (Stratford); (Stark); (Northumberland); (Milan); (Success); (Berlin); (Dalton); (Jefferson); (Carroll); Randolph, *Williams* (1895, 1896), *M.* 341 (1902), 1386 (1903), 4100 (1904); (Gorham); Shelburne, *Deane* (1883, 1908).

Clematis verticillaris DC. Rocky talus slopes, local.—Stratford, riverbank, *F. & P.* 16612 (1917); Stark, Devil's Slide, *P.* 17438 (1919); Lancaster, Mt. Prospect, *P.* 14206 (1913), 17813 (1920); Gorham, Alpine Cascade, *P.* 12779 (1910).

CALTHA [Rupp.] L. Marsh Marigold.

Caltha palustris L. Swamps, commoner northward.—Pittsburg, *P.* 11066 = *M.* 3749 (1907); Stewartstown, *P.* 10351 = *M.* 3411 (1907); Colebrook, *F. & P.* 16562 (1917); Stratford, *P.* 13635 (1912); Northumberland, *F. & P.* 16611 (1917); Randolph, rare, *V. D. Lowe* (1917).

COPTIS Salisb. Goldthread.

Coptis trifolia (L.) Salisb. Wet woods, common.—Pittsburg, near Third Lake, *P.* 10327 = *M.* 3515 (1907); Dartmouth College Grant, *P.* 16190 (1914); (Clarksville); (Colebrook); (Columbia); (Millsfield); Stratford, *P.* 13590 (1912); (Stark); (Northumberland); Milan, *P.* 13863 (1912); (Success); (Lancaster); (Dalton); (Jefferson); Randolph, *M.* 969 (1903), *Mrs. G. F. Moore* (1905), *P.* 11190 (1908); Shelburne, *Deane* (1882, 1883, 1884), *Miss R. K. Stowell* (1916); Low & Burbank Grant, *M.* 3356 (1907), *Miss F. C. Prince* (1892); Thompson & Meserve Purchase, Northern Peaks, *M.* 1055 (1903), Great Gulf, *Williams* (1897), *P.* 11231 (1908), Carriage Road, *Deane* (1882); Cutts Grant, Oakes Gulf, *Williams* (1893).

AQUILEGIA [Tourn.] L. Columbine.

Aquilegia canadensis L. Rocky woods, rare.—Northumberland, Cape Horn, *P.* 16454 (1917); Lancaster, Mt. Prospect, *P.* 14205 (1913), Mt. Orne, *P.* 14525 (1913); Hadley Grant, Hart Ledge, *P.* 16466 (1915).

AQUILEGIA VULGARIS L. Frequently escaped from cultivation and long persistent; flowers variable, white, pink, or purple.—Colebrook, *P.* 10893 = *M.* 3975 (1907); Columbia, *P.* 10373 = *M.* 3917 (1907), *F. & P.* 16621 (1917); Whitefield, *Deane* (1896); Jefferson, *P.* 16402 (1915); Randolph, *P.* 4092 (1904); Shelburne, *Deane* (1917).

AQUILEGIA CAERULEA James, var. HYBRIDA Hort. Rare escape from gardens.—Shelburne, *Deane* (1918).

ACTAEA L. BANEBERRY.

Actaea rubra (Ait.) Willd. RED BANEBERRY. Rich woods, frequent.—Pittsburg, near Third Lake, *M.* 3506 (1907); (Stewartstown); Colebrook, *P.* 10892 = *M.* 3982, 3945 (1907), road to Piper Hill, *P.* 17709 (1919), form with thickish pedicels; (Columbia); (Stratford); (Stark); (Lancaster); (Dalton); Whitefield, *Deane* (1896); Carroll, Crawford's, *Miss S. Minns* (no date); Randolph, *Williams* (1895), *Mrs. G. F. Moore* (1905), *M.* 425 (1908), *P.* 12032 (1909); (Gorham); Shelburne, *Deane* (1883, 1916); Cutts Grant, Oakes Gulf, *Williams* (1895).

Actaea rubra (Ait.) Willd., f. **neglecta** (Gillman) Robinson. Rich woods, occasional.—Colebrook, *P.* 10885 = *M.* 3981 (1907); Randolph, *M.* 4256 (1908); Low & Burbank Grant, King Ravine, *P.* 552 (1902); Green Grant, *P.* 17114 (1918); (Sargent Purchase).

Actaea alba (L.) Mill. WHITE BANEBERRY. Rich woods, frequent.—Pittsburg, First Lake, *Mrs. A. F. Stevens* (1895); (Colebrook); Columbia, *M.* 3919 (1907); (Millsfield); Stratford, *P.* 13604 (1912); (Stark); Lancaster, *P.* 16925 (1917); Dalton, *M.* 5017 (1913); Jefferson, *P.* 16839 (1916); Randolph, *Williams* (1895), *M.* 376 (1902), 1413 (1903), *P.* 11687 (1908); Gorham, *Williams* (1895), *P.* 10572 (1907); Shelburne, *Deane* (1883, 1916), *Miss M. Sheppard* (1916).

BERBERIDACEAE (BARBERRY FAMILY).

CAULOPHYLLUM Michx. BLUE COHOSH.

Caulophyllum thalictroides (L.) Michx. Rich woods, frequent.—Pittsburg, First Lake, *Mrs. A. F. Stevens* (1895); Clarksville, *P.* 10463 = *M.* 3713 (1907); Colebrook, *W. Boott*

(1855), *P.* 10925 = *M.* 3886 (1907), *M.* 4030 (1907); Stratford, *F. & P.* 17018 (1917); Stark, Devil's Slide, *P.* 17503 (1919); Lancaster, Mt. Tug, *P.* 16740 (1916), Mt. Prospect, *P.* 14247 (1913); Randolph, *P.* 5379 (1904), 9909 (1906); Shelburne, *Deane* (1884, 1916).

BERBERIS [Tourn.] L. Barberry.

Berberis vulgaris L. Rarely adventive or persistent.—Errol, one bush persistent near house on Errol Hill, *P.* 16532 (1915); Gorham, one bush near village, *P.* 17413 (1919).

PAPAVERACEAE (POPPY FAMILY).

SANGUINARIA [Dill.] L. Bloodroot.

Sanguinaria canadensis L. Rich woods, local.—Northumberland, *P.* 12128 (1909); Lancaster, *P.* 12811 (1910).

CHELIDONIUM [Tourn.] L. Celandine.

Chelidonium majus L. Rare.—Martin Location, one plant in old cellar-hole, *P.* 18095 (1921), 19139 (1922).

PAPAVER [Tourn.] L. Poppy.

Papaver Rhoeas L. Corn Poppy. Rare escape.—Shelburne, *Deane* (1917).

Papaver somniferum L. Common Poppy. Occasional escape and on dumps.—Whitefield, *F. A. Shute, Deane* (1895); Berlin, dump, *P.* 14496 (1913); Shelburne, *Deane* (1917).

FUMARIACEAE (FUMITORY FAMILY).

ADLUMIA Raf. Climbing Fumitory.

Adlumia fungosa (Ait.) Greene. Rocky woods, very local.—Mt. Prospect, *G. B. Wellman* (1913), *P.* 14248 (1913). Said to have grown in Lancaster for at least fifty years, according to G. B. Wellman.

DICENTRA Bernh.

Dicentra Cucullaria (L.) Bernh. Dutchman's Breeches. Rich woods, frequent.—Pittsburg, near Third Lake, *P.* 10191 = *M.* 3474 (1907); Clarksville, *M.* 3770 (1907); Stratford, *P.* 13442 (1912); Randolph, *P.* 10233 = *M.* 3311 (1907), *P.* 16442 (1917);

Shelburne, *Miss R. K. Stowell & Miss M. Greenough* (1916); Carroll, Fabyans, *E. & C. E. Faxon* (1880); Thompson & Meserve Purchase, Base Station, *E. & C. E. Faxon* (1882).

CORYDALIS [Dill.] Medic.

Corydalis sempervirens (L.) Pers. Pale Corydalis. Ledges and burned ground, frequent.—Dartmouth College Grant, *P.* 10584 (1907); Colebrook, *P.* 10773 = *M.* 4019 (1907); (Stark); Northumberland, Cape Horn, *P.* 16474 (1917); Berlin, *P.* 16120 (1914); Lancaster, *P.* 14523 (1913); Randolph, Ice Gulch, *Williams* (1896), *P.* 607 (1902); Gorham, *P.* 10804 (1907), 11340 (1908); Shelburne, *Deane* (1881, 1882, 1910, 1920); Pinkham Grant, *P.* 13891 (1912); Hadley Grant, Mt. Hope, *P.* 16471 (1915), Hart Ledge, *P.* 16634 (1915).

FUMARIA [Tourn.] L. Fumitory.

Fumaria officinalis L. Rarely adventive.—Jefferson, ballast at Cherry Mt. station, *P.* 16640 (1915).

CRUCIFERAE (MUSTARD FAMILY).

BERTEROA DC.

Berteroa incana (L.) DC. Rarely adventive.—Dartmouth College Grant, College Farm, *P.* 12600 (1910).

IBERIS [Dill.] L. Candytuft.

Iberis umbellata L. Rare garden escape.—Randolph, *P.* 16760 (1916).

THLASPI [Tourn.] L. Penny Cress.

Thlaspi arvense L. Railroad tracks and waste ground, occasional.—Colebrook, *P.* 17810 (1920); Success, Success Pond, *P.* 16661 (1917); (Berlin); Lancaster, *P.* 12794 (1910), 16373 (1915); Jefferson, *P.* 16369 (1915); Gorham, *P.* 17144 (1918); Shelburne, *Deane* (1917).

LEPIDIUM [Tourn.] L. Peppergrass.

Lepidium virginicum L. Infrequent.—(Berlin); Green Grant, *P.* 4033 (1904); Shelburne, *Deane* (1915).

Lepidium apetalum Willd. Roadsides, etc., frequent.—Stewartstown, *P.* 11002 = *M.* 3777, *P.* 10972 = *M.* 3676 (1907); (Colebrook); Whitefield, *Deane* (1895); Jefferson, *P.* 13625 (1912), 16701 (1917); Randolph, *Williams* (1896), *P.* 6416 (1904); Gorham, *M.* 4286 (1908); (Berlin); Shelburne, *Deane* (1918); Green Grant, *M.* 4301 (1908).

Lepidium campestre (L.) R. Br. Rarely adventive.—Pittsburg, Indian Stream valley, *P.* 14153 (1913).

CAPSELLA Medic. Shepherd's Purse.

Capsella Bursa-pastoris (L.) Medic. Abundant weed.—Pittsburg, *P.* 10973 = *M.* 3678 (1907); (Colebrook); Stratford, *P.* 13633 (1912); (Success); (Milan); Berlin, *P.* 12723 (1910), 14497 (1913), 16519 (1915); (Jefferson); Randolph, *Williams* (1897), *M.* 3380, 4080, *P.* 10636 (1907), 12774 (1910); Gorham, *P.* 16593 (1915); Shelburne, *Deane* (1917).

CAMELINA Crantz. False Flax.

Camelina microcarpa Andrz. Fields, occasional.—Berlin, *P.* 12722 (1910); Whitefield, *P.* 14591 (1913); Jefferson, *P.* 10788 (1907), 16498 (1915); Randolph, *P.* 14447 (1913); Gorham, *P.* 12681 (1910); Shelburne, *Deane* (1903, 1908); Carroll, *P.* 12693, 12699 (1910).

NESLIA Desv. Ball Mustard.

Neslia paniculata (L.) Desv. Grain-fields and ballast, infrequently adventive.—Berlin, railroad track, *P.* 16515 (1915); Randolph, *P.* 17124 (1918), 17370 (1919).

RAPHANUS [Tourn.] L. Radish.

Raphanus Raphanistrum L. Jointed Charlock. Fields, common.—(Colebrook); Milan, *P.* 13839 (1912); Berlin, *P.* 11645 = *M.* 4516 (1908); Lancaster, *P.* 12350 (1909); Dalton, *P.* 11593 (1908), 16406 (1915); Whitefield, *M.* 4441 (1908); Carroll, *P.* 12714 (1910); Gorham, *M.* 4290 (1908); Shelburne, *Deane* (1914, 1915).

Raphanus sativus L. Radish. Weed in old fields, frequent.—Colebrook, *P.* 13924 (1912); Randolph, *Williams* (1897), *M.* 222 (1902), 4252 (1908); Shelburne, *Deane* (1918).

BRASSICA [Tourn.] L. MUSTARD.

BRASSICA ARVENSIS (L.) Ktze. CHARLOCK. Fields, common.—Pittsburg, *P.* 10417 = *M.* 3640 (1907); Berlin, *P.* 11341, 11646 = *M.* 4515 (1908); Randolph, *Williams* (1897), *P.* 12743 (1910); Gorham, *P.* 11456 (1908), 17356 (1919); Shelburne, *Deane* (1909); Carroll, *P.* 12716 (1910); Sargent Purchase, summit of Mt. Washington, *Williams* (1901).

BRASSICA JUNCEA (L.) Coss. Fields, occasional.—Lancaster, *Deane* (1896); Randolph, *Williams* (1897), *P.* 12034 (1909); Gorham, *P.* 11459 (1908).

BRASSICA NIGRA (L.) Koch. BLACK MUSTARD. Occasional.—Whitefield, *Deane* (1896), *M.* 5024 (1913); Randolph, *M.* 202 (1902).

BRASSICA CAMPESTRIS L. RUTA-BAGA. Fields, very common.—Pittsburg, village, *P.* 10997 = *M.* 3679 (1907); Stewartstown, *P.* 10996 = *M.* 3673 (1907); Milan, *P.* 13833 (1912); (Success); Berlin, *P.* 5699 (1904); Lancaster, *Deane* (1896); Whitefield, *Deane* (1896), *M.* 4336 (1908); Randolph, *P.* 10061 = *M.* 3280, 4087 (1907); Shelburne, *Deane* (1883, 1909, 1910).

MALCOLMIA [R. Br. in] Ait.

MALCOLMIA MARITIMA R. Br. Rare garden weed.—Shelburne, *A. E. Philbrook* (1917).

CONRINGIA [Heist.] Adans. HARE'S-EAR MUSTARD.

CONRINGIA ORIENTALIS (L.) Dumort. Rarely adventive, on ballast.—Shelburne, *Deane* (1917).

SISYMBRIUM [Tourn.] L. HEDGE MUSTARD.

SISYMBRIUM OFFICINALE (L.) Scop. Waste ground, occasional.—Carroll, *P.* 16577 (1915); Jefferson, *P.* 12685 (1910); Shelburne, *Deane* (1914).

SISYMBRIUM OFFICINALE (L.) Scop., var. LEIOCARPUM DC. Waste ground, common.—Colebrook, *P.* 11056 = *M.* 3781 (1907); Berlin, *P.* 11329, *M.* 4496 (1908); (Dalton); Randolph, *M.* 1380 (1903), *P.* 11413 (1908); Gorham, *P.* 11772 = *M.* 4326 (1908); Shelburne, *Deane* (1914); Martin Location, *P.* 17219 (1918).

Sisymbrium altissimum L. Tumble Mustard. Waste ground, especially railroad tracks, recently becoming frequent.—Stewartstown, *P.* 11001 (1907); (Colebrook); Northumberland, *P.* 12140 (1909); Milan, *P.* 13845 (1912); Berlin, *P.* 10707 (1907), *M.* 4502 (1908); Lancaster, *P.* 12791 (1910), 14553 (1913); Whitefield, *P.* 11613 = *M.* 4344, 4340 (1908); Carroll, Quebec Junction, *P.* 12700 (1910); Jefferson, Riverton, *P.* 17238 (1918); Randolph, *P.* 4031 (1904), *M.* 4589 (1909); Gorham, *P.* 10713 (1907); Shelburne, *P.* 11671 (1908), *Deane* (1913, 1916); Martin Location, *P.* 17208 (1918).

ERYSIMUM [Tourn.] L. Treacle Mustard.

Erysimum cheiranthoides L. Adventive on ballast, dumps, etc., frequent.—Stewartstown, *P.* 10999 = *M.* 3778 (1907); Colebrook, *F.* & *P.* 16629 (1917); Success, *P.* 14596 (1913); Berlin, *P.* 11304, 11637, *M.* 4476, 4493 (1908); Lancaster, *P.* 12792 (1910); Whitefield, *P.* 16671 (1916); Carroll, *P.* 12711 (1910); Randolph, *P.* 10652 (1907), 12775 (1910), 17089 (1918); Gorham, *P.* 17393 (1919); Shelburne, *Deane* (1909, 1917), *Miss A. Blook* (1916); Martin Location, *P.* 17220 (1918), 19138 (1922); Green Grant, *P.* 16575 (1915).

RORIPA Scop. Water Cress.

Roripa sylvestris (L.) Bess. (*Radiculas ylvestris* (L.) Druce). Yellow Cress. Rare weed.—Berlin, dump, *P.* 16502 (1915); Shelburne, garden weed, *Deane* (1917).

Roripa palustris (L.) Bess. (*Radicula palustris* (L.) Moench). Marsh Cress. Wet ditches, etc., common.—Dartmouth College Grant, *P.* 16196 (1914); (Colebrook); Stark, *P.* 12726 (1910); Milan, *P.* 13707 (1912); Berlin, *M.* 4491 (1908); (Dalton); Whitefield, *M.* 4334 (1908), *P.* 14192 (1913); Carroll, Fabyans, *M.* 1372 (1903); Jefferson, *Williams* (1895); Randolph, *P.* 5413, 5414 (1904), *M.* 4190, 4242 (1908); Gorham, *M.* 4261 (1908), *P.* 12870 (1910); Shelburne, *Deane* (1914, 1916); Green Grant, *P.* 13906 (1912); (Pinkham Grant).

Roripa palustris (L.) Bess., var. **hispida** (Desv.) Rydberg (*Radicula palustris* (L.) Moench, var. *hispida* (Desv.) Robinson). Similar localities, frequent.—Pittsburg, First Lake, *P.* 10170,

11084 = *M.* 3599 (1907); (Colebrook); (Stratford); Berlin, *P.* 5420, 5421 (1904); Gorham, *P.* 16442 (1915).

Roripa Armoracia (L.) A. S. Hitchcock (*Radicula Armoracia* (L.) Robinson). Horseradish. Escaped and persistent.—Stewartstown, *P.* 10258 = *M.* 3403 (1907); (Columbia); (Stark); Berlin, *P.* 16463 (1917); Gorham, *P.* 17401 (1919); Shelburne, *Deane* (1914).

BARBAREA R. Br. Winter Cress.

Barbarea orthoceras Ledeb. (*Rhod.* 11 (1909), 140). Very local.—Sargent Purchase, Tuckerman Ravine, *Williams* (1895).

Barbarea vulgaris R. Br. Adventive in fields, infrequent.—Pittsburg, *P.* 11031 = *M.* 3724 (1907), Indian Stream valley, *P.* 14135 (1913); Carroll, Bretton Woods, *P.* 16662 (1916); Gorham, *P.* 18229 (1921).

Barbarea vulgaris R. Br., var. longisiliquosa Carion (*B. stricta* Andrz.; *cf. Rhod.* 11 (1909), 138). Infrequently adventive.—Atkinson & Gilmanton Academy Grant, Hellgate, *P.* 14131 (1913); Carroll, Crawford's, *P.* 16682 (1916).

DENTARIA [Tourn.] L. Toothwort.

Dentaria diphylla Michx. Rich woods, occasional.—Clarksville, *P.* 11032 = *M.* 3769 (1907); Stewartstown, *F. & P.* 16616 (1917); Colebrook, *P.* 11044 = *M.* 3790, *P.* 10420 = *M.* 3899 (1907); Errol, *P.* 12643 (1910); Lancaster, *P.* 12810 (1910); Carroll, Fabyans, *C. E. Faxon* (1880); Randolph, *P.* 12033 (1909); Shelburne, *P.* 11677 (1908).

CARDAMINE [Tourn.] L. Bitter Cress.

Cardamine bellidifolia L., var. **laxa** Lange. Heads of ravines in the alpine region, very local.—Thompson & Meserve Purchase, head of the Great Gulf, *W. Boott* (1855), *E. & C. E. Faxon* (1877, 1879, 1887, 1888, 1895, 1896), *Williams* (1893, 1895, 1897), *W. W. Eggleston* (1898, 1901), *P.* 621 (1901), 622 = *M.* 272 (1902), *M.* 362 (1902), *P.* 11197 (1908), 12078 (1909), Cow Pasture, *J. R. Churchill* (1895), sixth mile-post, *P.* 10593 (1909); Sargent Purchase, Alpine Garden, *E. & C. E. Faxon* (1889), Huntington Ravine, *F. & P.* 16857 (1917); Mt. Washington, not definitely

located, *J. A. Allen* (1876, 1878), *E. Faxon, C. G. Pringle* (1877), *W. N. Suksdorf* (1887), *J. R. Churchill* (1895); alpine region, not definitely located, *Oakes* (no date), *A. Gray* (1842), *H. Mann* (1862).

Cardamine parviflora L. Shaded ledges, rare.—Northumberland, Cape Horn, *P.* 16461 (1917); (Stark, Devil's Slide).

Cardamine pennsylvanica Muhl. Wet places, common.—Pittsburg, near Third Lake, *M.* 3495 (1907), First Lake, *P.* 10201 (1907); Stewartstown, *F. & P.* 16571, 16593, 16636, 17014 (1917); Colebrook, *F. & P.* 16582 (1917); (Columbia); (Millsfield); Errol, *F. & P.* 16985 (1917); Stratford, *P.* 13601 (1912); Dummer, *Williams* (1895); Lancaster, *Deane* (1896); (Dalton); Jefferson, *P.* 16507 (1917); Randolph, *P.* 10016, *M.* 3253 (1907), *P.* 16427 (1917), 17100 (1918); (Gorham); Shelburne, *Deane* (1883, 1903, 1914); Martin Location, *P.* 16421 (1917); Thompson & Meserve Purchase, head of Ravine of the Castles, *Williams* (1896).

ARABIS L. Rock Cress.

Arabis glabra (L.) Bernh. Tower Mustard. Roadsides, etc., especially northward; appearing adventive.—Pittsburg, *P.* 10353 = *M.* 3430 (1907); Dixville, *P.* 16313 (1914); Stewartstown, *P.* 10367 = *M.* 3493 (1907), *F. & P.* 16570 (1917); Colebrook, *P.* 10930 = *M.* 3979 (1907); Columbia, *P.* 10481 = *M.* 3923 (1907); Errol, *P.* 12641 (1910); Northumberland, *P.* 12170 (1909), 16423 (1915); Success, *P.* 14123 (1913); Berlin, *P.* 11305 (1908); Jefferson, *P.* 14360 (1913).

Arabis Drummondi Gray. Cliffs and rocky talus, rare.—Stark, Devil's Slide, *P.* 17458 (1919); Sargent Purchase, Huntington Ravine, *P.* 13901 (1912), *F. & P.* 16881 (1917).

Arabis hirsuta (L.) Scop. Very local.—Lancaster, Mt. Prospect, *P.* 16928 (1917), 17236 (1918).

SARRACENIACEAE (PITCHER-PLANT FAMILY).

SARRACENIA [Tourn.] L. Pitcher-plant.

Sarracenia purpurea L. Peat bogs, common.—Pittsburg, *P.* 10166 = *M.* 3440 (1907); Dartmouth College Grant, *P.* 16216 (1914); (Stewartstown); Northumberland, lower Jonathan Pond,

P. 13626 (1912); Milan, Mud Pond, *P.* 13877 (1912); Carroll, Crawford's, *Williams* (1895); (Jefferson); Randolph, Pond of Safety, *P.* 646 (1902), *M.* 1144 (1903), *P.* 5375 (1904); Shelburne, *Deane* (1882, 1883, 1884), *P.* 11316 = *M.* 4133 (1908), *Deane* (1914).

DROSERACEAE (SUNDEW FAMILY).

DROSERA L. Sundew.

Drosera rotundifolia L. Bogs and moist sand, common.—Dartmouth College Grant, *P.* 16208 (1914); Dixville Notch, *Deane* (1917); (Clarksville); (Stewartstown); (Columbia); Northumberland, *P.* 13582 (1912); Milan, *P.* 13800 (1912); Success, Mt. Success, *P.* 1130 (1903); Berlin, York Pond, *P.* 17168 (1918); Lancaster, *P.* 12147 (1909); Dalton, *P.* 17840 (1920); Carroll, *P.* 17560 (1919), Crawford's, *J. M. Greenman* (1898); Randolph, *Williams* (1895), *P.* 648 (1900), *M.* 4213 (1908); (Gorham); Shelburne, *Deane* (1881, 1882, 1883, 1917); (Bean Purchase); Martin Location, *P.* 14396 (1913); Cutts Grant, Oakes Gulf, 4500 ft., *T. O. Fuller* (1900).

Drosera longifolia L. Bogs and sandy shores, occasional.—Milan, Mud Pond, *P.* 13753 (1912); Berlin, Head Pond, *P.* 13760 (1912); Whitefield, Weed Pond, *P.* 14416 (1913); Jefferson, Cherry Pond, *P.* 10662 (1907), 11464 (1908); Shelburne, Dream Lake, *P.* 19219 (1923).

CRASSULACEAE (ORPINE FAMILY).

SEDUM [Tourn.] L. Stonecrop.

Sedum acre L. Rare garden escape.—Stratford, North Stratford village, *F. & P.* 16907 (1917).

Sedum triphyllum (Haw.) S. F. Gray (*S. purpureum* Tausch; *cf. Rhod.* II (1909), 46). Live-for-ever. Frequently persistent or escaping.—Pittsburg, *P.* 11105 = *M.* 3535 (1907); Colebrook, *M.* 3976 (1907); (Errol); (Stratford); (Northumberland); Lancaster, *P.* 12342 (1909); (Carroll); (Jefferson); Randolph, *M.* 4588 (1909), *P.* 13063 (1910); (Berlin).

SAXIFRAGACEAE (SAXIFRAGE FAMILY).

SAXIFRAGA [Tourn.] L. Saxifrage.

Saxifraga virginiensis Michx. Early Saxifrage. Shaded ledges, not common.—Stark, Devil's Slide, *P.* 17450 (1919);

Northumberland, Cape Horn, *P.* 16453 (1917); Lancaster, Mt. Prospect, *P.* 14543 (1913); Randolph, Ice Gulch, *P.* 12874 (1910), 16652 (1917); Gorham, *P.* 16405 (1915); Shelburne, locally common, *Deane* (1909, 1910); Hadley Grant, Mt. Hope, *P.* 16452 (1915).

Saxifraga rivularis L. Alpine Brook Saxifrage. Moist head of the Great Gulf, very local.—Thompson & Meserve Purchase, Great Gulf, *W. Boott* (1855), *E. & C. E. Faxon* (1877, 1878, 1879, 1884, 1885, 1886, 1888), *C. G. Pringle* (1877, 1879), *O. Bangs* (1893), *J. R. Churchill*, *Williams* (1895), *W. W. Eggleston* (1901), *P.* 12069 (1909), 12918 (1910); alpine region, not definitely located, *Oakes* (no date), *H. Mann* (1862, 1863).

TIARELLA L. False Mitrewort.

Tiarella cordifolia L. Woods, common.—Pittsburg, Third Lake, *M.* 3486 (1907), First Lake, *P.* 10960 (1907); Dartmouth College Grant, *P.* 16254 (1914); (Stewartstown); (Columbia); (Millsfield); Stratford, *P.* 13525 (1912); (Dummer); (Stark); (Success); (Berlin); Lancaster, *S. N. F. Sanford* (1914); (Dalton); Whitefield, *Deane* (1895); (Jefferson); (Carroll); (Low & Burbank Grant); Randolph, *M.* 345 (1902), 959 (1903), 3259, 3316, *P.* 10064 (1907), 16441 (1917); Gorham, *Deane* (1909); Shelburne, *Deane* (1882, 1884, 1909).

MITELLA [Tourn.] L. Mitrewort.

Mitella diphylla L. Rich woods, rare.—Northumberland, Lost Nation-Groveton road, *P.* 16058 (1914); Dalton, Cushman, *P.* 17385 (1919).

Mitella nuda L. Cold mossy woods, frequent.—Pittsburg, *P.* 10301 = *M.* 3473 (1907); Stewartstown, *P.* 10209 = *M.* 3396 (1907); Colebrook, *M.* 3784 (1907), *P.* 13939 (1912); Columbia, *P.* 10375 = *M.* 3834 (1907); (Millsfield); Stratford, *P.* 13511 (1912); Dummer, *P.* 16543 (1917); Stark, Devil's Hop Yard, *P.* 16753 (1916); (Success); Berlin, *P.* 16509 (1915); Dalton, *P.* 16389 (1915), 17841 (1920); Whitefield, *Deane* (1895); Randolph, Ice Gulch, *J. R. Churchill* (1889), *Williams* (1894, 1895), *P.* 10818 (1907); Gorham, *P.* 17801 (1920); Shelburne, *Deane* (1884), *W. G. Farlow* (1894); Bean Grant, Mt. Pleasant, *P.* 16785 (1916).

CHRYSOSPLENIUM [Tourn.] L. Golden Saxifrage.

Chrysosplenium americanum Schwein. Cold wet places, common.—Dartmouth College Grant, *P.* 16130 (1914); (Stewartstown); (Colebrook); Millsfield, *P.* 18173 (1921); Northumberland, *P.* 16470 (1917); (Success); (Jefferson); Randolph, *Williams* (1896), *M.* 1039 (1903), *P.* 10241 = *M.* 3272 (1907); (Gorham); Shelburne, *Deane* (1916); (Pinkham Grant); Low & Burbank Grant, Valleyway, *P.* 16489 (1915); (Thompson & Meserve Purchase).

RIBES L. Currant; Gooseberry.

Ribes Cynosbati L. Prickly Gooseberry. Rocky woods, frequent.—Colebrook, *P.* 10926 = *M.* 3817, 4034 (1907); Stratford, *P.* 13631 (1912); (Stark); Northumberland, *P.* 12245 (1909); Lancaster, *P.* 14535 (1913); Whitefield, *Deane* (1896); Carroll, *P.* 17459 (1919); Jefferson, *P.* 16726 (1916); Randolph, *P.* 12329 (1909); Gorham, *P.* 16356 (1915); Shelburne, *Deane* (1883), *P.* 11337 = *M.* 4160 (1908), *Deane* (1910, 1914).

Ribes hirtellum Michx. (*R. oxyacanthoides* of *Manual*, in great part; *cf. Rhod.* 13 (1911), 74). Smooth Gooseberry. Margins of bogs, etc., frequent.—Pittsburg, First Lake, *P.* 10379 = *M.* 3534 (1907); Stewartstown, Ladd Pond, *F. & P.* 16590 (1917); Millsfield, *F. & P.* 16993 (1917); Errol, *P.* 12612 (1910); Stratford, *P.* 13605 (1912); Milan, West Milan, *P.* 14007 (1912); Whitefield, *Deane* (1896); Carroll, Twin Mt., *P.* 16676 (1916), Crawford's, *Williams* (1895), *P.* 11749 (1908).

Ribes Grossularia L. European Gooseberry. Rare escape.—Milan, West Milan, *P.* 13960 (1912).

Ribes americanum Mill. (*R. floridum* L'Hér.; *cf. Rhod.* 11 (1909), 46). Wild Black Currant. Rare.—Whitefield, *Deane* (1896).

Ribes nigrum L. Black Currant. Rarely escaped or persistent.—Lancaster, Mt. Orne, *P.* 14526 (1913); Randolph, *P.* 10527, *M.* 3314, 4086 (1907).

Ribes lacustre (Pers.) Poir. Swamp Black Currant. Cold damp woods, common.—Pittsburg, near Third Lake, *P.* 10304 = *M.* 3503 (1907); (Columbia); (Millsfield); (Success); Berlin, *P.* 16099 (1914); Randolph, Ice Gulch, *Williams* (1895), *P.* 665

(1902), *M.* 1045 (1903); Gorham, Alpine Cascade, *Deane* (1884); Low & Burbank Grant, *P.* 10211 = *M.* 3359 (1907); Thompson & Meserve Purchase, Great Gulf, *M.* 263 (1902); Sargent Purchase, Ammonoosuc Ravine, *P.* 16763 (1916); Cutts Grant, Oakes Gulf, 4000 ft., *Williams* (1893); Bean Purchase, *M.* 5069 (1913).

Ribes prostratum L'Hér. Skunk Currant. Damp or rocky woods, common.—Pittsburg, Second Lake, *P.* 10321 = *M.* 3427 (1907); Stratford, *P.* 13475 (1912); (Stark); (Northumberland); (Milan); (Success); Berlin, *Deane* (1883), *P.* 16263 (1914); Whitefield, *Deane* (1895, 1896); Carroll, Twin Mt., *P.* 16643 (1916); Randolph, *M.* 1046 (1903); Gorham, *P.* 12525 (1909); Shelburne, *Deane* (1882, 1914); Low & Burbank Grant, *P.* 10213 = *M.* 3341 (1907); Thompson & Meserve Purchase, Cape Horn, 4500 ft., *Williams, J. M. Greenman* (1898); Sargent Purchase, Tuckerman Ravine, *H. Mann* (1862), *E. & C. E. Faxon* (1887), *Williams* (1895), *M.* 4069 (1909); Bean Purchase, Carter Notch, *W. Boott* (1855), *M.* 5068 (1913).

Ribes vulgare Lam. Red Garden Currant. Rare escape from gardens.—Randolph, *P.* 12244 (1909); Shelburne, *Deane* (1921). The older reports of this as a native species (*e. g.*, W. F. Flint in *Rep. of Forest Comm. of N. H.* (1885), 43; E. Tuckerman in T. S. King's *White Hills* (1887), 236) rest upon a confusion with the following species.

Ribes triste Pall., var. **albinervium** (Michx.) Fern. Swamp Red Currant. Cool moist woods, frequent.—Pittsburg, near Third Lake, *P.* 10287 = *M.* 3510, 3478 (1907); Dixville Notch, *Deane* (1917); (Stewartstown); Colebrook, *P.* 10842, *M.* 4027 (1907); (Columbia); Stratford, Sugarloaf Mt., *P.* 13476 (1912); Success, *P.* 10676 (1907); Whitefield, *Deane* (1895); Carroll, *Williams* (1895), Twin Mt., *P.* 16642 (1916), Bretton Woods, *E. & C. E. Faxon* (1880), Crawford's, *E. & C. E. Faxon* (1881); (Jefferson); (Low & Burbank Grant); Randolph, *Williams* (1895), *P.* 10676½ (1906); (Gorham); Martin Location, *P.* 14352 (1913).

HAMAMELIDACEAE (WITCH-HAZEL FAMILY).

HAMAMELIS L. Witch-hazel.

Hamamelis virginiana L. Damp woods, frequent southward.—(Stark); Northumberland, Cape Horn, *P.* 16450 (1917);

Lancaster, *Deane* (1896); Randolph, *M.* 142 (1901), *P.* 4145, 4146 (1904), *M.* 4881 (1911); Gorham, *P.* 11479 (1908), 16081 (1914); Shelburne, *Deane* (1882, 1883), *A. E. Philbrook* (1888); Martin Location, *P.* 14290 (1913); Hadley Grant, Hart Ledge, *P.* 16611 (1915).

ROSACEAE (ROSE FAMILY).

SPIRAEA [Tourn.] L.

Spiraea latifolia (Ait.) Borkh. Meadow Sweet. Pastures, common.—Pittsburg, First Lake, *M.* 3564 (1907), west of Indian Stream, *P.* 11027 (1907); Dartmouth College Grant, *P.* 16175 (1914); (Stewartstown); Colebrook, *M.* 3937 (1907); (Columbia); (Cambridge); (Stratford); (Stark); Northumberland, *Miss H. Pease* (1918); (Milan); (Success); (Berlin); Kilkenny, *P.* 14002 (1912); (Dalton); Carroll, Crawford's, *Williams* (1895); (Jefferson); Randolph, *M.* 205 (1902), *P.* 11656 (1908), *M.* 4587 (1909); (Gorham); Shelburne, *Deane* (1882, 1883); Martin Location, *P.* 14300 (1913).

Spiraea latifolia (Ait.) Borkh., var. **septentrionalis** Fern. (*Rhod.* 19 (1917), 255). Alpine meadows and heads of ravines, occasional.—Thompson & Meserve Purchase, Mt. J. Q. Adams, *P.* 9890 (1906), Carriage Road, *P.* 10543 (1907), 12832, 12833 (1910); Sargent Purchase, Alpine Garden, *Williams* (1897), *B. L. Robinson* (1901), Huntington Ravine, *F. & P.* 16882 (1917), Tuckerman Ravine, *M.* 4065 (1907), Lakes of the Clouds, *B. L. Robinson* (1901); Bean Purchase, Imp Camp, *P.* 16763 (1917).

Spiraea tomentosa L. Hardhack; Steeple Bush. Pastures, common.—(Columbia); (Northumberland); Milan, *P.* 13813 (1912); (Berlin); (Lancaster); (Carroll); (Jefferson); Randolph, *Williams* (1895), *M.* 285 (1902), *P.* 4063 (1904); (Gorham); Martin Location, *P.* 14293 (1913); Shelburne, *Deane* (1882, 1883).

SORBARIA A. Br.

Sorbaria sorbifolia (L.) A.Br. Frequently persistent and escaping from cultivation.—Colebrook, *P.* 10922 = *M.* 3986 (1907); Stratford, *P.* 13446 (1912); Whitefield, *Deane* (1895); Randolph, *M.* 4044, *P.* 10803 (1907); Gorham, *P.* 12893 (1910); Shelburne, *Deane* (1919).

PYRUS [Tourn.] L.

Pyrus Malus L. Apple. Spontaneous by roads, railroads, etc., frequent.—(Stark); Dalton, *M.* 4435 (1908), 5007 (1913); Whitefield, *M.* 5047 (1913); Carroll, *P.* 14386 (1913); Randolph, *P.* 10757 (1907), *M.* 4189 (1908); (Gorham); Shelburne, *M.* 4158 (1908), *Deane* (1914); Sargent Purchase, Mt. Washington Carriage Road, *P.* 13902 (1912).

Pyrus arbutifolia (L.) L. f., var. **atropurpurea** (Britton) Robinson. Swamps, ledges, etc., infrequent.—Kilkenny, Green Ledge, *P.* 14001 (1912); Dalton, Forest Lake, *P.* 17568 (1919); Shelburne, Wheeler Bog, *Deane* (1882, 1884), *P.* 11203 = *M.* 4129 (1908), *Deane* (1914, 1916).

Pyrus melanocarpa (Michx.) Willd. Swamps, etc., common.—Stewartstown, *F. & P.* 16574 (1917); Colebrook, *P.* 10901 = *M.* 4024 (1907); Stratford, *P.* 13471 (1912); Stark, *P.* 14121 (1913); Northumberland, *P.* 13550 (1912); Milan, *P.* 14009 (1912); (Berlin); Lancaster, *P.* 12214 (1909); Dalton, *P.* 11493 = *M.* 4437 (1908); Carroll, *P.* 16578 (1915); Low & Burbank Grant, Jefferson Notch, *P.* 11248 (1908); Randolph, *P.* 9914 (1906), 16293 (1914), 17852 (1920); Gorham, *P.* 13662 (1912); Shelburne, *Deane* (1883, 1884, 1909, 1916), *Mrs. G. Sheffield* (1912).

Pyrus americana (Marsh.) DC. American Mountain Ash. Borders of streams and in cool woods, common.—Pittsburg, Third Lake, *P.* 10829 (1907), First Lake, *P.* 10964 = *M.* 3630 (1907); (Millsfield); (Stark); (Success); (Berlin); (Dalton); (Carroll); Jefferson, Riverton, *P.* 16529 (1917), with very pubescent leaves; Randolph, *P.* 9935 (1906), *M.* 3338 (1907), *P.* 18085 (1920); (Gorham); Shelburne, *Deane* (1882, 1885, 1909, 1916); (Pinkham Grant); Bean Purchase, Carter Notch, *P.* 4695 (1904); (Low & Burbank Grant); Thompson & Meserve Purchase, Cape Horn, *Williams* (1903); Sargent Purchase, Carriage Road, *Deane* (1882); Mt. Washington, not definitely located, *W. Boott* (1855).

Pyrus dumosa (Greene) Fern. (not *P. sitchensis* Piper; *cf. Rhod.* 23 (1921), 266). Riverbanks and borders of fields, frequent.—Pittsburg, First Lake, *Mrs. A. F. Stevens* (1895); (Dixville); Millsfield, *P.* 18194 (1921); (Stratford); Milan, *P.* 13742 (1912); (Success); Carroll, Bretton Woods, *P.* 11194 (1908);

Crawford Purchase, *C. E. Faxon* (1891); (Jefferson); Randolph, *P.* 10943 (1907), 18084 (1920); Gorham, *P.* 13651 (1912); Low & Burbank Grant, Valleyway, *P.* 14163 (1913); Thompson & Meserve Purchase, Cape Horn, *Williams* (1895); Sargent Purchase, Tuckerman Ravine, *E. & C. E. Faxon, Williams* (1895); Bean Purchase, Carter Notch, *E. & C. E. Faxon* (1890).

AMELANCHIER Medic. Shad Bush; Sugar Plum.

Amelanchier laevis Wieg. (*A. canadensis* of *Manual*, not Medic.; *cf. Rhod.* 14 (1912), 154–158). Hedge rows, etc., common.—Pittsburg, First Lake, *P.* 10995 = *M.* 3635 (1907); Stewartstown, *F. & P.* 16901 (1917); Colebrook, *F. & P.* 16825 (1917); (Columbia); Stratford, *P.* 13529 (1912); Stark, *P.* 14145 (1913), 17476 (1919); (Success); Whitefield, *Deane* (1896); Carroll, *P.* 14374 (1913), Crawford's, *Williams* (1895); Randolph, *P.* 680 (1902), *M.* 4189 (1908), *P.* 14209 (1913), 17862 (1920); Gorham, *P.* 14181 (1913), 16010 (1914); Shelburne, *Deane* (1913); Martin Location, *P.* 14355 (1913); Bean Purchase, Wild River valley, *P.* 16020 (1914), North Baldface Mt., *P.* 16044 (1914).

Amelanchier laevis × stolonifera. Rare.—Shelburne, *Deane* (1910, 1913, 1914).

Amelanchier stolonifera Wieg. (*A. spicata* of *Manual*, not (Lam.) K. Koch; *cf. Rhod.* 14 (1912), 144–147). Exposed ledges or sandy soil. Androscoggin valley, occasional.—Cambridge, Lake Umbagog, *P.* 16554 (1915); Errol, *F. & P.* 16990 (1917); Berlin, Mt. Forist, *P.* 16101 (1914); Shelburne, *Deane* (1882, 1883, 1910, 1914).

Amelanchier Bartramiana (Tausch.) Roem. (*A. oligocarpa* (Michx.) Roem.; *cf. Rhod.* 14 (1912), 158–161). Cool swamps and mountain woods, occasional at low altitudes and common at higher ones.—Pittsburg, Second Lake, *P.* 10312 = *M.* 3432 (1907); Stewartstown, *F. & P.* 16662 (1917); Stratford, *P.* 13482 (1912); Success, Mt. Success, *P.* 11205 = *M.* 4118 (1908); Whitefield, *P.* 14196 (1913), 16683 (1916); Carroll, Crawford's, *E. & C. E. Faxon* (1877, 1881, 1891); Low & Burbank Grant, Valleyway, *P.* 684 (1901); Thompson & Meserve Purchase, Parapet, *P.* 10216 (1907), Carriage Road, *Deane* (1882), Cape Horn, *J. M. Green-*

man, Williams (1898); Sargent Purchase, Tuckerman Ravine, *E. & C. E. Faxon* (1888), *W. W. Eggleston* (1901), *M.* 1073 (1903), Lakes of the Clouds, *W. Boott* (1855); Mt. Washington, not definitely located, *W. F. Flint & J. H. Huntington* (1876), *E. & C. E. Faxon* (1878, 1890), *W. C. Cusick* (1887), *W. W. Eggleston* (1903); Cutts Grant, Oakes Gulf, *Williams* (1893, 1895); Bean Grant, Mt. Jackson, *P.* 12320 (1909); Pinkham Grant, *Deane* (1920); Bean Purchase, Imp Camp, *P.* 16758 (1917), West Royce Mt., *P.* 18137 (1921).

Amelanchier Bartramiana × laevis. Occasional.—Dartmouth College Grant, *P.* 16171 (1914); Carroll, Crawford's, *E. Faxon* (1881); Shelburne, *Deane* (1882); Bean Purchase, *P.* 16051 (1914).

CRATAEGUS [Tourn.] L. Hawthorn.

Crataegus Keepii Sarg. (*cf. Rhod.* 5 (1903), 165–166). Local.—Shelburne, *Deane* (1913).

Crataegus rotundifolia Moench. Occasional.—Clarksville, *P.* 11024 (1907); Gorham, railroad track near Randolph line, *P.* 17583 (1919).

Crataegus rotundifolia Moench, var. **pubera** Sarg. The commonest form in the County.—Pittsburg, northeast of First Lake, *P.* 10963 (1907), east of Pittsburg village, *P.* (1919); Colebrook, near Piper Hill, *P.* 17736 (1919); Stratford, *P.* 17713 (1919); Northumberland, base of Cape Horn, *P.* 16468 (1917); Lancaster, near Baker Pond, *P.* 17806 (1920), Orne Mt., *P.* 14550 (1913); Jefferson, near Bailey's Station, *P.* 11010 (1907); Randolph, road to Bowman, *P.* 686 (1902); Shelburne, *Deane* (1913, 1914, 1916, 1917), *Miss R. K. Stowell* (1916).

Crataegus insolens Sarg. (*C. lucorum* Sarg., var. *insolens* (Sarg.) Eggleston). Occasional.—Randolph, *Williams* (1896), *P.* 4036 (1904), 11510 (1908).

Crataegus roanensis Ashe. Local.—Shelburne, *Deane* (1882, 1883, 1902, 1907, 1909, 1913, 1919).

Crataegus acutiloba Sarg. (*C. macrosperma* Ashe, var. *acutiloba* (Sarg.) Eggleston). Occasional.—Errol, *Williams* (1895); Colebrook, *W. Boott* (1865); Stark, rocky woods, Devil's Slide, *P.* 17484 (1919); Milan, old field, West Milan, *P.* 13756

(1912); Berlin, bank of Androscoggin near Berlin Mills, *P.* 23 (June, 1917); Whitefield, along railroad southwest of Whitefield Junction, *P.* 14594 (1913).

FRAGARIA [Tourn.] L. STRAWBERRY.

Fragaria virginiana Duchesne. Fields and woods, common.—Pittsburg, First Lake, *P.* 10175, *M.* 3580, 3590 (1907); (Stewartstown); (Colebrook); Stratford, *P.* 13541, 13567 (1912); Dummer, *P.* 16549 (1917); (Stark); (Milan); (Success); (Berlin); Whitefield, *Deane* (1896); (Jefferson); Randolph, *Williams* (1897), *P.* 693 (1902), *M.* 965, 1033 (1903), *P.* 4201 (1904), 10019 = *M.* 3291, 3278, 3279, 3367 (1907), *P.* 11174 (1908); Gorham, *Deane* (1908); Shelburne, *Deane* (1882, 1903, 1909, 1910, 1916); Martin Location, *P.* 14296 (1913); (Pinkham Grant); Thompson & Meserve Purchase, Carriage Road, 3500 ft., *F.* & *P.* 16884 (1917).

Fragaria virginiana Duchesne, var. **terrae-novae** (Rydb.) Fern. & Wieg. (*Rhod.* 13 (1911), 106). Occasional.—Pittsburg, First Lake, *P.* 10171 (1907); Dartmouth College Grant, *P.* 16236 (1914); Stewartstown, bogs, *F.* & *P.* 16664, 16740 (1917); Colebrook, *F.* & *P.* 16580 (1917); Jefferson, *P.* 16729 (1917); Randolph, *P.* 12228 (1909); Thompson & Meserve Purchase, Carriage Road, *F.* & *P.* 16870 (1917); Cutts Grant, Oakes Gulf, *Williams* (1898).

Fragaria vesca L., var. **americana** Porter. Rocky woods, frequent.—Dartmouth College Grant, Gorge of Diamond River, *P.* 12605 (1910); Columbia, *F.* & *P.* 16789 (1917); Lancaster, Mt. Prospect, *P.* 14220 (1913); Randolph, *M.* 3255 (1907); Gorham, Alpine Cascade, *P.* 16431 (1915); Shelburne, *Deane* (1883, 1917).

FRAGARIA GRANDIFLORA Ehrh. Rarely escaped.—Pittsburg, First Lake, *P.* 10174 = *M.* 3579 (1907); Shelburne, *Miss L. M. Brown* (1920).

SIBBALDIA L.

Sibbaldia procumbens L. Headwalls of alpine ravines, very local.—Sargent Purchase, Tuckerman Ravine, *Oakes* (1846), *W. Boott* (1855), *C. G. Pringle* (1877), *E.* & *C. E. Faxon* (1877, 1878, 1879, 1880, 1886, 1895), *W. G. Farlow* (1884), *J. R. Churchill* (1895), *Williams* (1895, 1897), *W. W. Eggleston* (1901), *P.* 748 (1902), 11542 (1908), *R. B. Mackintosh* (1904).

POTENTILLA L. CINQUEFOIL.

POTENTILLA ARGUTA Pursh. Dry fields, rarely adventive.—Randolph, *P.* 18094 (1921); Gorham, *P.* 12522 (1909).

POTENTILLA MONSPELIENSIS L. (including var. *norvegica* (L.) Rydb.). Roadsides and waste ground, common.—Pittsburg, Second Lake, *P.* 10276 = *M.* 3443 (1907); Dartmouth College Grant, *P.* 16165 (1914); (Millsfield); (Columbia); (Stratford); (Northumberland); (Stark); (Kilkenny); Milan, *P.* 13708 (1912); (Berlin); (Success); (Gorham); Shelburne, *Deane* (1882, 1883, 1919); Martin Location, *P.* 14338 (1913); Randolph, *P.* 718 = *M.* 245 (1902), *P.* 5409 (1904); (Low & Burbank Grant); (Jefferson); Whitefield, *Deane* (1896); (Dalton); Carroll, *Williams* (1895), Crawford's, *Williams, J. M. Greenman* (1898).

Potentilla monspeliensis L., var. **labradorica** (Lehm.) Fern. Gravelly or turfy places in the cirques of Mt. Washington, somewhat localized.—Sargent Purchase, headwall of Tuckerman Ravine, *E. & C. E. Faxon* (1886), *P.* 11531 (1908), 13903 (1912), Fan, Huntington Ravine, *P.* 13894 (1912), *F. & P.* 16880 (1917).

POTENTILLA ARGENTEA L. SILVERY CINQUEFOIL. Roadsides and waste ground, occasional.—Stratford, *P.* 13553 (1912); (Success); (Berlin); Lancaster, *P.* 14540 (1913); Whitefield, *P.* 16674 (1916); Thompson & Meserve Purchase, Base Station, *P.* 16781 (1916); Randolph, *P.* 17179 (1918); Gorham, *P.* 12673 (1910); Shelburne, *Deane* (1883), *P.* 11170 = *M.* 4103 (1908); Green Grant, *M.* 1415 (1903), *P.* 13910 (1912).

POTENTILLA RECTA L. Rarely adventive.—Jefferson, Jefferson Notch Road, *V. D. Lowe* (1921).

Potentilla Robbinsiana Oakes. Gravelly soil in one limited locality at the base of the cone of Mt. Monroe.—Cutts Grant, *Oakes* (no date), *Tuckerman* (no date), *A. Gray* (1842), *T. P. James* (1858), *H. Mann* (1862, 1863), *W. Boott* (1865), *J. W. Chickering* (1875), *E. & C. E. Faxon* (1877, 1878, 1881, 1888, 1889), *J. A. Allen* (1880), *J. R. Churchill* (1895), *Williams* (1895, 1898), *J. M. Greenman* (1898), *W. W. Eggleston* (1899, 1903), *B. L. Robinson* (1901), *P.* 711 = *M.* 286 (1902), *M.* 1069 (1903), *P.* 11141 (1908).

Potentilla palustris (L.) Scop. Bogs and margins of ponds, frequent.—Pittsburg, Second Lake, *P.* 10242 = *M.* 3431 (1907), First Lake, *P.* 10161 = *M.* 3566 (1907); Stewartstown, Ladd Pond, *P.* 10386 = *M.* 3972 (1907); Columbia, Lime Pond, *P.* 10449 = *M.* 3851 (1907); Cambridge, Lake Umbagog, *P.* 16547 (1915); Berlin, Dead River, *P.* 17473 (1919); Northumberland, lower Jonathan Pond, *P.* 13545 (1918), Horseshoe Pond, *P.* 17261 (1918); Lancaster, Baker Pond, *P.* 17266 (1918); Jefferson, Bailey station, *P.* 14237 (1913), Cherry Pond, *P.* 10573 (1907); Gorham, canal, *P.* 16913 (1916).

Potentilla palustris (L.) Scop., var. **villosa** (Pers.) Lehm. (*Rhod.* II (1909), 48). Similar localities, less common.—Cambridge, Lake Umbagog, *P.* 18196 (1921); Shelburne, *Deane* (1915).

Potentilla fruticosa L. Shrubby Cinquefoil. Ledges, etc., rare.—Stark, Devil's Slide, *P.* 17455 (1919); Carroll, foot of Mt. Willard Road, *Williams* (1895).

Potentilla tridentata Ait. Rocky and gravelly mountain-tops, abundant; at lower levels locally very abundant in sandy soil.—Dartmouth College Grant, Diamond Peaks, *P.* 10583 (1907); Dixville Notch, *P.* 18147 (1921); Stratford, Percy Peaks, *P.* 12731 (1907); Stark, near Crystal, *P.* 14123 (1913); Milan, West Milan, *P.* 10570 (1907); Kilkenny, Green Ledge, *P.* 13959 (1912); Carroll, Twin Mt. station, *P.* 12629 (1910), Crawford's, *Miss S. Minns* (1888); Jefferson, Boy Mt. station, *P.* 10653 (1907); Randolph, Appalachia, *P.* 10872 (1907), *M.* 4255 (1908), *P.* 16723 (1916); Gorham, *P.* 12676 (1910), Mt. Hayes, *P.* 12821 (1910); Shelburne, *Deane* (1882, 1883, 1915), Shelburne Moriah Mt., *Miss A. W. Christensen & Miss C. A. Gauthier* (1917), *D. S. Rushmore* (1918); Bean Purchase, North Baldface Mt., *P.* 16042 (1914); Low & Burbank Grant, Knife Edge, *P.* 12192 (1909); Thompson & Meserve Purchase, Parapet, *P.* 16490 (1915), Mt. Adams, *M.* 256 (1902), Great Gulf, *E. & C. E. Faxon* (1887), Carriage Road, *Deane* (1882), Cape Horn, *Williams* (1896), *B. L. Robinson* (1901); Mt. Washington, not definitely located, *W. Boott* (1853), *W. F. Flint & J. H. Huntington* (1876), *J. R. Churchill* (1895), *E. D. Merrill* (1896); Cutts Grant, Crawford Path, *Williams* (1893); Bean Grant, Mt. Clinton, *H. St. John*

(1909), Mt. Webster, *P.* 11715 (1908); Hadley Grant, Mt. Crawford, *P.* 11710 (1908); alpine region, not definitely located, *H. Mann* (1862).

Potentilla tridentata Ait., f. **hirsutifolia** Pease (*Rhod.* **16** (1914), 194–195). Rare.—Milan, $4\frac{1}{2}$ miles south of West Milan, *P.* 13871 (1912): type collection.

Potentilla pumila Poir. Dry soil, rare.—Shelburne, *F. & P.* 16975 (1917).

Potentilla canadensis L. Rare.—Stratford, *P.* 13574 (1912).

Potentilla canadensis L., var. **simplex** (Michx.) Torr. & Gray. Dry soil, common.—Pittsburg, First Lake, *P.* 10134 = *M.* 3628 (1907); Milan, *P.* 13794 (1912); (Carroll); (Low & Burbank Grant); Randolph, *Williams* (1896), *P.* 10012 = *M.* 3277 (1907), *P.* 12766 (1910); Shelburne, *Deane* (1910); Martin Location, *P.* 14249 (1913).

FILIPENDULA [Tourn.] Hill.

Filipendula Ulmaria (L.) Maxim. Queen of the Meadow. Rarely escaped.—Jefferson, *P.* 10632 (1907).

GEUM L. Avens.

Geum canadense Jacq., f. **glandulosum** Fernald & Weatherby (*Rhod.* **24** (1922), 48). Roadsides and copses, rare.—Colebrook, village, *F. & P.* 16641 (1917); Randolph, near Peek Park, *P.* 16719 (1916); Shelburne, near Mill Brook, *Deane* (1922).

Geum virginianum L., var. **Murrayanum** Fern. (*cf. Rhod.* **25** (1923), 98–99). Copses, etc., infrequent.—Columbia, *P.* 10414 = *M.* 3918 (1907); Lancaster, *P.* 17105 (1918); Randolph, *P.* 18207 (1921).

Geum macrophyllum Willd. Rich soil, frequent.—Pittsburg, Second Lake, *M.* 3444 (1907); Atkinson & Gilmanton Academy Grant, Hellgate, *P.* 12598 (1910); Stewartstown, *P.* 10262 = *M.* 3413 (1907); (Colebrook); (Columbia); (Millsfield); Errol, *Williams* (1895); (Success); (Lancaster); Dalton, *P.* 11609 (1908); Carroll, Cherry Mt. Road, *P.* 14366 (1913), Crawford's, *Williams* (1898); Crawford Purchase, *P.* 11258 (1908), Base Station, *E. & C. E. Faxon* (1878); (Jefferson); Randolph, *P.* 752 (1901);

Low & Burbank Grant, *P.* 12309 (1909); Bean Purchase, Carter Notch, *W. Boott* (1855), *M.* 5064 (1913).

Geum strictum Ait. Wet meadows, occasional.—Colebrook, *P.* 10924 = *M.* 3980 (1907); (Millsfield); (Lancaster); Whitefield, *Deane* (1895); Carroll, *P.* 17419 (1919); (Jefferson); Randolph, *Williams* (1897), *M.* 242 (1902), *P.* 10873 (1907).

Geum rivale L. Water Avens. Wet meadows, frequent.—Pittsburg, west of Indian Stream, *P.* 11017 (1907); Dix Grant, *P.* 16137 (1914); Stewartstown, *F. & P.* 16609 (1917); Stratford, *P.* 13515 (1912); Northumberland, *F. & P.* 16572 (1917); Success, *P.* 16554 (1917); Lancaster, *P.* 16377 (1915); Dalton, *P.* 16415 (1915), 17380 (1919); Carroll, Crawford's, *Miss S. Minns* (no date); Jefferson, *P.* 14238 (1913); Randolph, *M.* 1056 (1903), *P.* 10065 (1907); Shelburne, Shelburne Moriah Mt., 2500 ft., *W. H. Munter* (1919).

Geum Peckii Pursh. Common on alpine barrens and meadows, rarely at lower levels.—Low & Burbank Grant, *P.* 12093 (1909); Thompson & Meserve Purchase, Madison Huts, *Williams* (1893), *M.* 1103 (1903), *P.* 10848 (1907), Edmands Col, *M.* 354 (1902), Mt. Jefferson, *P.* 700 (1900), Great Gulf, *Williams* (1895), Carriage Road, *Deane* (1882, 1884); Sargent Purchase, summit of Mt. Washington, *E. D. Merrill* (1896), Alpine Garden, *E. & C. E. Faxon* (1889, 1890), *Williams* (1896), Tuckerman Ravine, *J. R. Churchill* (1889, 1890), Carriage Road, *Deane* (1882); Mt. Washington, not definitely located, *F. Boott* (1816), *W. F. Flint & J. H. Huntington* (1876), *C. E. Faxon, J. A. Allen* (1878), *W. P. Rich* (1880); Pinkham Grant, Crystal Cascade, *W. F. Flint* (1871); Cutts Grant, Oakes Gulf, *E. Faxon* (1890), *J. M. Greenman* (1898), *M.* 4558 (1909); alpine region, not definitely located, *Oakes* (no date), *Tuckerman* (no date), *A. Gray* (1842), *H. Mann* (1862); Pinkham Grant, Thompson Falls, *P.* 10704 (1907).

RUBUS [Tourn.] L. Bramble.

Rubus idaeus L., var. **canadensis** Richardson (*Rhod.* 21 (1919), 97). Raspberry. Rich soil, common.—Stewartstown, *F. & P.* 15639 (1917); Millsfield, *P.* 18174 (1921); Stratford, *F. & P.* 15636 (1917); Randolph, *P.* 18222 (1921); Shelburne,

Deane (1919); Pinkham Grant, *P.* 17648 (1919); Low & Burbank Grant, Short Line, *F. & P.* 15629, 15630, 15631 (1917), Valleyway, *F. & P.* 15623, 15625, 15626 (1917), Knife Edge, *P.* 12096 (1909); Sargent Purchase, Huntington Ravine, *F. & P.* 15628 (1917); Crawford Purchase, Jefferson Notch Road, *P.* 11249 (1908).

Rubus idaeus L., var. **strigosus** (Michx.) Maxim. (*Rhod.* 21 (1919), 97). Raspberry. Pastures, woods, etc., very common.—(Pittsburg); Dartmouth College Grant, *P.* 16248 (1914); (Clarksville); Stewartstown, *F. & P.* 15638 (1917); (Columbia); Millsfield, *P.* 18171 (1921); Stratford, *F. & P.* 15637 (1917); Carroll, *P.* 17435 (1919); Randolph, *P.* 11412 (1908); Low & Burbank Grant, Valleyway, *F. & P.* 15624 (1917); Shelburne, *Deane* (1919); Sargent Purchase, Huntington Ravine, *F. & P.* 15627 (1917).

Rubus idaeus L., var. **strigosus** (Michx.) Maxim., f. **albus** (Fuller) Fern. (*Rhod.* 21 (1919), 96). Rare.—Randolph, west of Appalachia station, *P.* 17611 (1919).

Rubus idaeus L., var. **strigosus** (Michx.) Maxim., f. **tonsus** Fern. (*Rhod.* 21 (1919), 96). Occasional.—Berlin, *P.* 19081 (1922); Carroll, *P.* 17435 (1919); Randolph, *P.* 18221 (1921); Shelburne, *Deane* (1919); Pinkham Grant, *P.* 17644 (1919).

Rubus odoratus L. Purple Flowering Raspberry. Rich or rocky woods, more common in the Connecticut valley.—Stark, Bald Mt., *P.* 14151 (1913); Northumberland, Lost Nation, *Williams* (1906); Lancaster, Mt. Prospect, *P.* 14230 (1913); Dalton, *P.* 11585 = *M.* 4404 (1908), 5076 (1913); Whitefield, *P.* 14193 (1913); Randolph, *Williams* (1895), *P.* 12680 (1910), Ice Gulch, *P.* 16706 (1917); Gorham, *P.* 17371 (1919); Shelburne, *Deane* (1883); Hadley Grant, Hart Ledge, *P.* 16458 (1915).

Rubus Chamaemorus L. Cloudberry; Baked-apple Berry. Sphagnous open bogs on mountain-tops, local.—Success, Mt. Success, *P.* 11172 = *M.* 4093 (1908); Shelburne, Shelburne Moriah Mt., *Miss A. W. Christensen & Miss C. A. Gauthier* (1917); Cutts Grant, Mt. Monroe, *W. Boott* (1865); Sargent Purchase, Mt. Pleasant, *E. Faxon* (1877); Bean Grant, Mt. Clinton, *E. & C. E. Faxon* (1878, 1880, 1881, 1883, 1895), *J. A. Allen* (1880), *Wil-*

liams (1895), *W. W. Eggleston* (1901), *M.* 1070 (1903), *P.* 12357 (1909), Mt. Jackson, *P.* 12302, 12318 (1909), *H. St. John* (1912); alpine region, not definitely located, *Oakes* (no date), *W. Boott* (1855), *J. W. Chickering* (1862), *W. F. Flint & J. H. Huntington* (1876), *Miss S. Minns* (1888).

Rubus pubescens Raf. (*R. triflorus* Richards.). Dwarf Raspberry. Low woods, and meadows, common.—Pittsburg, near Third Lake, *P.* 10325=*M.* 3514 (1907), near Second Lake, *M.* 3663 (1907); Dartmouth College Grant, *P.* 16234 (1914); (Stewartstown); (Colebrook); Columbia, *M.* 3845 (1907); (Millsfield); Stratford, *P.* 13483 (1912); (Dummer); (Stark); (Northumberland); (Lancaster); (Dalton); Whitefield, *Deane* (1896); (Carroll); (Jefferson); Randolph, *P.* 10060, *M.* 3251 (1907), *P.* 11149 (1908); (Gorham); Shelburne, *Deane* (1882, 1917); (Bean Purchase); (Low & Burbank Grant); Thompson & Meserve Purchase, Great Gulf, *E. Faxon* (1877); Sargent Purchase, Tuckerman Ravine, *M.* 253 (1902); Cutts Grant, Oakes Gulf, *Williams* (1895, 1898).

Rubus allegheniensis Porter. Dryish pastures and woods, common.—(Columbia); Northumberland, *P.* 13584 (1912), *F. & P.* 15845 (1917); Dummer, *F. & P.* 15793 (1917); (Berlin); Lancaster, *F. & P.* 15686 (1917); Jefferson, *Mrs. E. H. Terry* (1902); Randolph, *P.* 9910 (1906); Gorham, *F. & P.* 15670 (1917); Shelburne, *Deane* (1902), *F. & P.* 15763, 15764, 15831 (1917), *Deane* (1919).

Rubus allegheniensis Porter, var. **Gravesii** Fern. Infrequent.—Shelburne, *F. & P.* 15738 (1917), *Deane* (1920).

Rubus fraternus Brainerd & Peitersen (*Blackberries of N. E.* (1920), 59). Rare.—Stratford, *F. & P.* 15813 (1917).

Rubus glandicaulis Blanchard. Open sandy soil, occasional.—Stewartstown, *F. & P.* 15760 (1917); Stratford, *F. & P.* 15622 (1917); Northumberland, *F. & P.* 15779 (1917); Dummer, Pontook Dam, *F. & P.* 15649 (1917); Shelburne, *Deane* (1919).

Rubus pergratus Blanchard. Thickets, frequent.—Colebrook, *F. & P.* 15794 (1917); Northumberland, *F. & P.* 15675, 15736, 15842 (1917); Jefferson, *Mrs. E. H. Terry* (1902), *P.* 16899 (1916); Gorham, *F. & P.* 15620, 15643 (1917); Shelburne, *Deane* (1919).

Rubus frondisentis Blanchard. Dry or boggy soil, frequent.—Stewartstown, *F. & P.* 15600 (1917); Colebrook, *F. & P.* 15604, 15605, 15661, 15723 (1917); Columbia, *F. & P.* 15713 (1917); Millsfield, *F. & P.* 15658 (1917); Errol, *F. & P.* 15783 (1917); Stratford, *F. & P.* 15666, 15724, 15728 (1917); Northumberland, *F. & P.* 15722, 15784 (1917); Lancaster, *F. & P.* 15817 (1917); Jefferson, *P.* 11095 (1908); Randolph, *P.* 12071 (1909), *F. & P.* 15660, 15733, 15781 (1917); Shelburne, *Deane* (1922).

Rubus recurvans Blanchard. Sandy soil, occasional.—Whitefield, Whitefield Junction, *M. L. Fernald* (1917); Shelburne, *F. & P.* 15640 (1917), *Deane* (1920).

Rubus abbrevians Blanchard. Dryish pastures, occasional.—Stratford, *F. & P.* 15715 (1917); Northumberland, *F. & P.* 15716 (1917); Whitefield, *P.* 16698 (1917); Shelburne, *F. & P.* 15765 (1917).

Rubus canadensis L. Thickets and rocky soil, common; extending to the highest elevations and farthest up the valleys of any of our blackberries.—Pittsburg, near Canaan line, *P.* 10988 = *M.* 3762 (1907), *F. & P.* 15759 (1917); Stewartstown, *P.* 10204 = *M.* 3407 (1907); Colebrook, *F. & P.* 15758 (1917); (Columbia); (Stratford); Dummer, *F. & P.* 15646, 15671 (1917); Stark, Percy, *P.* 17085 (1917); Milan, *P.* 13925 (1912); (Success); Lancaster, *F. & P.* 15683 (1917); Carroll, Crawford's, *E. Faxon* (1895); Jefferson, Riverton, *P.* 16526 (1917); Randolph, *P.* 737 (1902), 9911 (1906); (Low & Burbank Grant); Gorham, *P.* 12200 (1909), *F. & P.* 15671, 15681, 15725 (1909); Shelburne, *F. & P.* 15762 (1917), *Deane* (1918); (Bean Purchase); Pinkham Grant, *P.* 11549 (1908); Thompson & Meserve Purchase, Carriage Road, 3600 ft., *F. & P.* 15599 (1917).

Rubus canadensis × pergratus. Not infrequent.—Colebrook, *F. & P.* 15758 (1917); Errol, *F. & P.* 15674 (1917); Dummer, *F. & P.* 15761 (1917); Gorham, *F. & P.* 15672 (1917).

Rubus multiformis Blanchard (*Rhod.* 8 (1906), 179–180). Borders of woods, occasional.—Errol, *F. & P.* 15678 (1917); Gorham, Mascot Pond, *F. & P.* 15659 (1917); Sargent Purchase, Carriage Road, 2500 ft., *F. & P.* 15744 (1917).

Rubus elegantulus Blanchard. Occasional.—Stewartstown, *F. & P.* 15732 (1917); Northumberland, *F. & P.* 15644, 15823 (1917); Dummer, *F. & P.* 15792 (1917); Milan, *P.* 17400 (1919); Shelburne, *Deane* (1919, 1920).

Rubus recurvicaulis Blanchard (*Rhod.* 8 (1906), 153–155). Roadsides, rare.—Shelburne, *P.* 11162 (1908), *Deane* (1921).

Rubus vermontanus Blanchard (*Am. Bot.* 7 (1904), 1). Low thickets, common.—Pittsburg, near Back Lake, *F. & P.* 15682 (1917); Wentworth Location, *F. & P.* 15679 (1917); Stewartstown, *F. & P.* 15803, 15804 (1917), near Buck Pond, *F. & P.* 15830 (1917); Northumberland, *F. & P.* 15662 (1917); Success, *P.* 11770 (1908); Jefferson, *F. & P.* 15737 (1917); Gorham, *F. & P.* 15673 (1917); Martin Location, *P.* 14306 (1913); Shelburne, *F. & P.* 15746, 15780, 15782 (1917), *Deane* (1919).

Rubus vermontanus Blanchard, var. **viridifolius** Blanchard. Frequent.—Stewartstown, Ladd Pond, *F. & P.* 15650, 15714 (1917), Buck Pond, *F. & P.* 15840 (1917); Northumberland, *F. & P.* 15663 (1917), *P.* 17249 (1918); Jefferson, Cherry Mt. station, *P.* 16909 (1917); Shelburne, Wheeler Bog, *F. & P.* 15619 (1917), *Deane* (1921); Green Grant, *P.* 17204 (1918).

Rubus setosus Bigel. Damp or sandy soil, frequent.—Northumberland, *F. & P.* 15756, 15827 (1917); Whitefield, Whitefield Junction, *M. L. Fernald* (1917); Berlin, *P.* 17060 (1918); Shelburne, *F. & P.* 15748 (1917).

Rubus jacens Blanchard. Boggy thickets, infrequent.—Lancaster, *F. & P.* 15778 (1917); Gorham, Mascot Pond, *P.* 11689 (1908), *F. & P.* 15805 (1917), Mt. Hayes, *P.* 12812 (1910).

Rubus semierectus Blanchard (*Rhod.* 8 (1906), 156–157). Bogs, local.—Jefferson, bogs north of Cherry Pond, *P.* 10668 (1907).

Rubus trifrons Blanchard (*Am. Bot.* 11 (1906), 11). Sandy soil and low thickets, frequent.—Northumberland, *F. & P.* 15785 (1917); Lancaster, Coös Junction, *P.* 12111 (1909); Berlin, near Head Pond, *P.* 17038 (1918); Gorham, near Mascot Pond, *F. & P.* 15603 (1917), *P.* 16928 (1917).

Rubus hispidus L. Damp soil, frequent.—Berlin, near Head Pond, *P.* 17059 (1917); Lancaster, *P.* 12288 (1909); Whitefield, *J. A. Lowell* (no date), Burns Pond, *P.* 16686 (1917); Jefferson, *Mrs. E. H. Terry* (1902); Randolph, *P.* 12897 (1910), *F. & P.* 15829 (1917); Gorham, *P.* 12327 (1909), *F. & P.* 15829 (1917).

DALIBARDA Kalm.

Dalibarda repens L. Woods, especially in alluvial soil, frequent southward.—Errol, *Williams* (1895); Stratford, *P.* 13510 (1912); Dummer, *P.* 12658 (1910); Northumberland, *P.* 17150 (1918); Milan, *P.* 13861 (1912); Berlin, *P.* 16505 (1915); Lancaster, *P.* 16656 (1919); Dalton, *P.* 12267 (1910), 17571 (1919); Whitefield, *P.* 11568 = *M.* 4421 (1908), *P.* 14561 = *M.* 5020 (1913); Carroll, *W. Boott* (1855), Crawford's, *Miss S. Minns* (no date); Jefferson, *P.* 17504 (1919); Randolph, *Williams* (1896), *M.* 1399 (1903), *P.* 10767 (1907); Gorham, *P.* 13661 (1912); Shelburne, *C. E. Faxon* (1872), *Deane* (1881, 1882, 1883, 1914); Bean Purchase, Wild River valley, *P.* 16026 (1914).

AGRIMONIA [Tourn.] L. Agrimony.

Agrimonia gryposepala Wallr. Woods and roadsides, not common.—Columbia, Lime Pond, *P.* 10466 = *M.* 3843 (1907); Lancaster, *P.* 17818, 17829 (1920); Randolph, *Williams* (1895), *P.* 16444 (1915); Hadley Grant, Hart Ledge, *P.* 16612 (1915).

Agrimonia striata Michx. Alluvial woods and roadsides, common.—Stewartstown, *F. & P.* 16618 (1917); Colebrook, *M.* 4031 (1907); (Columbia); Cambridge, *P.* 16535 (1915); (Stratford); Stark, *P.* 12762 (1910), 17485 (1919); Milan, *P.* 13738 (1912); (Berlin); Lancaster, *P.* 12784 (1910); (Dalton); Whitefield, *Deane* (1897), *M.* 4406 (1908), *P.* 14190 (1913); (Jefferson); Randolph, *M.* 243, *P.* 676 (1902), 12764, 12772 (1910); (Gorham); Shelburne, *Deane* (1881, 1883).

SANGUISORBA [Rupp.] L. Burnet.

Sanguisorba canadensis L. Meadows, rare.—Stratford, 1½ miles north of Mapleton station, by railroad, probably adventive, *P.* 13555 (1912).

ROSA [Tourn.] L. Rose.

Rosa blanda Ait. Native on Connecticut River banks, occasionally adventive along railroad tracks, etc.—Columbia, *F. & P.* 16600 (1917); Stratford, railroad, *P.* 13637 (1912), very prickly form; Northumberland, *P.* 11154, 11155 (1908), 12134 (1909); Lancaster, *P.* 16384 (1915); Carroll, railroad near Twin Mt., *P.* 12717 (1910); Randolph, railroad, *P.* 12035 (1909), railroad near Bowman, *P.* 10528 (1910).

Rosa spinosissima L. Scotch Rose. Rare escape.—Dalton, *P.* 16410 (1915).

Rosa cinnamomea L. Cinnamon Rose. Commonly persistent and spreading along hedgerows.—Pittsburg, village, *P.* 11028 = *M.* 3725 (1907); Stewartstown, *P.* 10340 = *M.* 3388 (1907); Colebrook, *P.* 10923 = *M.* 3985 (1907); Stratford, *P.* 13636 (1912); (Milan); Randolph, *P.* 10852 (1907), *M.* 4199 (1908); Shelburne, *P.* 11323 = *M.* 4164 (1908), *Deane* (1909).

Rosa rubiginosa L. Sweetbrier; Eglantine. Rarely adventive.—Gorham, *P.* 16512 (1915).

Rosa gallica L. Locally persistent.—Shelburne, *Deane* (1910, 1914).

Rosa nitida Willd. Swamps, frequent.—Stewartstown, Buck Pond, *F. & P.* 16661 (1917); Columbia, Lime Pond, *P.* 10458 = *M.* 3859 (1907); Errol, Lake Umbagog, *P.* 10620 (1907); Northumberland, *P.* 12116 (1909); Milan, Mud Pond, *P.* 13759 (1912); Jefferson, Mud Pond, *P.* 17359 (1918); Dalton, Forest Lake, *P.* 17574 (1919).

Rosa virginiana Mill. Apparently adventive, rare.—Randolph, *P.* 12179 (1909).

Rosa carolina L. (*R. humilis* Marsh.). Dry soil, rare.—Shelburne, near Lead Mine Bridge, *Deane* (1921, 1922).

Rosa rugosa Thunb. Rarely adventive.—Shelburne, *Deane* (1917).

PRUNUS [Tourn.] L. Plum; Cherry.

Prunus serotina Ehrh. Wild Black Cherry. Roadsides and borders of fields, frequent.—Pittsburg, First Lake, *P.* 10089 = *M.* 3642 (1907); Stratford, *P.* 13531 (1912); (Stark); Milan, *P.* 13752

(1912); (Carroll); (Jefferson); Randolph, *M.* 1464 (1903), *P.* 10829 (1907); Gorham, *P.* 16078 (1914); Shelburne, *Deane* (1916); Martin Location, *P.* 14287 (1913).

Prunus virginiana L. Choke Cherry. Thickets, common.—Pittsburg, First Lake, *M.* 3533 (1907); Dartmouth College Grant, *P.* 16182 (1914); (Columbia); Stratford, *P.* 13519 (1912); (Stark); (Milan); (Success); (Lancaster); (Dalton); (Carroll); (Jefferson); Randolph, *Williams* (1895), *M.* 1463 (1903), 3533, 4083 (1907), *P.* 10758 (1907), 11143 (1908); (Gorham); Shelburne, *Deane* (1882).

Prunus pennsylvanica L. f. Wild Red Cherry. Clearings, burned lands, etc., very common.—Pittsburg, Third Lake, *P.* 10155 (1907); Dartmouth College Grant, *P.* 16184 (1914); (Colebrook); (Cambridge); Stratford, *P.* 13488 (1912); (Stark); (Milan); (Success); (Berlin); (Kilkenny); (Lancaster); Carroll, Mt. Clinton, *Williams* (1895); (Jefferson); Randolph, *Williams* (1895), *Mrs. G. F. Moore* (1905), *P.* 11625 (1908); Gorham, *P.* 16074 (1914); Shelburne, *Deane* (1883, 1910, 1916); (Low & Burbank Grant); (Thompson & Meserve Purchase); Sargent Purchase, floor of Tuckerman Ravine, *M.* 1066 (1903); (Bean Purchase).

Prunus institutia L. Bullace Plum. Roadsides, rarely persistent.—Shelburne, *Deane* (1918, 1919).

Prunus depressa Pursh (*P. pumila* Torr. not L.; *cf. Rhod.* 25 (1923), 73). River gravels and pebbly islands, rare.—Shelburne, *Deane* (1921).

Prunus nigra Ait. Canada Plum. Roadside thickets, occasional, always appearing introduced.—Clarksville, *P.* 10456 = *M.* 3697 (1907); Columbia, *P.* 10840 = *M.* 3916 (1907); Errol, *P.* 12619 (1910); Milan, *P.* 14008 (1912); Dalton, *P.* 11588 = *M.* 4450 (1908); Whitefield, *P.* 14593 (1913); Carroll, *P.* 14364 (1913); Randolph, *P.* 12233 (1909); Martin Location, *P.* 10587 (1907); Shelburne, *Deane* (1909).

LEGUMINOSAE (PULSE FAMILY).

TRIFOLIUM [Tourn.] L. Clover.

Trifolium arvense L. Rabbit-foot or Stone Clover. Waste ground, occasional.—Jefferson, *F. & P.* 16908 (1917); Ran-

dolph, *Williams* (1895), *P.* 792 (1902), *M.* 385 (1902); Gorham, *P.* 11466 (1908); Shelburne, *Deane* (1882), *P.* 11124 (1908), *Deane* (1917).

Trifolium pratense L. Red Clover. Meadows, very common.—Pittsburg, First Lake, *P.* 10109 = *M.* 3650 (1907); (Stewartstown); (Colebrook); (Columbia); (Cambridge); (Stratford); (Stark); (Milan); (Success); (Berlin); (Lancaster); (Dalton); (Carroll); (Low & Burbank Grant); (Jefferson); Randolph, *Williams* (1897), *M.* 970 (1903), *P.* 11177 (1908); (Gorham); Shelburne, *Deane* (1883).

Trifolium pratense L., albino form (possibly the var. *pallidum* (W. & K.) Fiori). Rare.—Stark (three stations), *P.* 16307 (1914).

Trifolium repens L. White Clover. Fields, very common.—Pittsburg, First Lake, *P.* 10164 = *M.* 3646 (1907); Colebrook, *M.* 3999 (1907); (Columbia); (Stratford); Milan, *P.* 13775 (1912); (Success); (Berlin); (Lancaster); (Dalton); (Carroll); (Jefferson); Randolph, *Williams* (1897), *P.* 10068 (1907), *M.* 4186 (1908); Martin Location, *P.* 14349 (1913); (Gorham); Shelburne, *Deane* (1915).

Trifolium hybridum L. Alsike. Fields and meadows, common.—Pittsburg, First Lake, *Mrs. A. F. Stevens* (1895), *P.* 10107 = *M.* 3649 (1907); (Stewartstown); (Columbia); (Stratford); Milan, *P.* 13771 (1912); (Success); (Berlin); (Lancaster); (Jefferson); Low & Burbank Grant, *M.* 4604 (1909); Randolph, *Williams* (1897), *M.* 203 (1902), *P.* 11178 (1908); (Gorham); Shelburne, *Deane* (1915, 1917); Thompson & Meserve Purchase, Cape Horn, *Williams* (1897).

Trifolium agrarium L. Yellow or Hop Clover. Waste places, frequent.—Pittsburg, village, *P.* 11030 = *M.* 3726 (1907); Colebrook, *P.* 11077 = *M.* 3803 (1907); (Columbia); (Northumberland); Success, *P.* 10641 (1907); (Berlin); (Lancaster); (Dalton); (Whitefield); Carroll, Crawford's, *J. M. Greenman* (1898); (Jefferson); (Low & Burbank Grant); Randolph, *P.* 789 (1902), 9913 (1906); Martin Location, *P.* 14304 (1913); Gorham, *Williams* (1895); Shelburne, *Deane* (1882), *P.* 11118 = *M.* 4110 (1908), *Deane* (1910).

Trifolium procumbens L. Low Hop Clover. Very locally adventive.—Berlin, *P.* 11634, 11764 = *M.* 4307, 4308 (1908).

MELILOTUS [Tourn.] Hill. Sweet Clover; Melilot.

Melilotus alba Desr. White Melilot. Occasionally adventive.—Berlin, *P.* 11629 = *M.* 4487 (1908); Gorham, *M.* 4260 (1908), *P.* 12674 (1910); Shelburne, *Deane* (1883, 1909); Martin Location, *P.* 19141 (1922).

Melilotus officinalis (L.) Lam. Yellow Melilot. Occasionally adventive.—Randolph, lumber camp near Pond of Safety, *P.* 12218 (1909); Gorham, *P.* 10726 (1907).

MEDICAGO [Tourn.] L. Medick.

Medicago lupulina L. Black Medick; Nonesuch. Waste ground, infrequent.—Randolph, *P.* 16319 (1914); Berlin, *P.* 11633 (1908); Gorham, *P.* 11773 = *M.* 4325 (1908).

Medicago sativa L. Alfalfa. Rarely adventive.—Shelburne, *Deane* (1911).

PETALOSTEMUM Michx. Prairie Clover.

Petalostemum candidum Michx. Rare waif.—Gorham, railroad track, *P.* 11468 (1908).

ROBINIA L. Locust.

Robinia Pseudo-Acacia L. Infrequently escaped from cultivation.—Whitefield, *P.* 16699 (1916); Shelburne, *Deane* (1917).

DESMODIUM Desv. Tick Trefoil.

Desmodium grandiflorum (Walt.) DC. Rich woods, local.—Shelburne, *Deane* (1883).

Desmodium canadense (L.) DC. Local.—Shelburne, *Deane* (1881, 1882, 1883, 1913).

CICER [Tourn.] L. Chick Pea.

Cicer arietinum L. Waste ground, rare.—Berlin, dump, *P.* 17136 (1918).

VICIA [Tourn.] L. VETCH.

VICIA ANGUSTIFOLIA Reichard. Occasionally adventive.—Lancaster, Mountorne station, *P.* 17148 (1918); Shelburne, *Deane* (1913, 1917).

VICIA ANGUSTIFOLIA Reichard, var. SEGETALIS (Thuillier) Koch. Waste ground, frequent.—Columbia, *P.* 16524 (1915); Stratford, *P.* 13944 (1912); Berlin, *P.* 11515 = *M.* 4499 (1908); Lancaster, *P.* 12795 (1910); Carroll, *P.* 12708 (1910); Jefferson, *P.* 12865 (1910), 16566 (1915); Randolph, *M.* 344 (1902), *P.* 16052 (1914); Gorham, *P.* 12899 (1910), 16602 (1915); Martin Location, *P.* 17221 (1918).

VICIA CRACCA L. Weed in grass-lands, common except in the Colebrook region.—Stewartstown, *P.* 11057 = *M.* 3670 (1907); Stratford, *P.* 13573 (1912); (Stark); Milan, *P.* 13692 (1912); (Success); (Berlin); (Dalton); (Jefferson); Randolph, *Williams* (1896), *M.* 204 (1902), *P.* 11279 (1908); (Gorham); Shelburne, *Deane* (1881, 1882, 1914, 1916).

VICIA VILLOSA Roth. Grass-land, rare.—Randolph, *P.* 800 (1897), 19085 (1922).

LATHYRUS [Tourn.] L.

LATHYRUS PRATENSIS L. Rarely adventive.—Gorham, Grand Trunk Railroad, near Cascade village, *P.* 17850 (1920).

PISUM [Tourn.] L. PEA.

PISUM SATIVUM L. GARDEN PEA. Fields and dumps.—Randolph, *M.* 4251 (1908); Berlin, *M.* 4481 (1908); Gorham, *P.* 11526 (1908); Shelburne, *P.* 11703 (1908), *Deane* (1913).

APIOS [Boehr.] Ludwig. GROUND NUT.

Apios tuberosa Moench. Alluvial thickets, local.—Lancaster, *P.* 12788 (1910); Shelburne, *P.* 11688 = *M.* 4172 (1908), *Deane* (1915).

PHASEOLUS [Tourn.] L. BEAN.

PHASEOLUS NANUS L. BUSH BEAN. Dumps and waste ground.—Pittsburg, Third Lake, *P.* 10288 = *M.* 3649 (1907); Stewartstown, *P.* 10971 = *M.* 3674 (1907); Whitefield, *M.* 4342 (1908); Berlin, *M.* 4486 (1908); Shelburne, *Deane* (1915).

AMPHICARPA Ell. Hog Peanut.

Amphicarpa monoica (L.) Ell. Alluvium of the larger valleys, local.—Northumberland, *P.* 12166 (1909); Lancaster, *P.* 14527 (1913); Dalton, Scott Junction, *P.* 12380 (1909); Shelburne, *P.* 11135 = *M.* 4177 (1908), *Deane* (1914, 1916).

LINACEAE (FLAX FAMILY).

LINUM [Tourn.] L. Flax.

Linum usitatissimum L. Common Flax. Railroad tracks and waste ground, frequent.—(Columbia); Berlin, *M.* 4472, 4500 (1908); Whitefield, *P.* 11611 (1908), 14590 (1913); Carroll, Fabyans, *P.* 11427 (1908); Jefferson, *P.* 10780 (1907); Randolph, *P.* 9918 (1906), *M.* 4467 (1908); Gorham, *P.* 10805 (1907); Shelburne, *P.* 11670 (1908), *Miss C. M. Cresfield* (1914).

OXALIDACEAE (WOOD SORREL FAMILY).

OXALIS L. Wood Sorrel.

Oxalis montana Raf. (*O. Acetosella* of Am. authors, not L.; *cf. Rhod.* 22 (1920), 143–144). Common Wood Sorrel; Oxalis. Damp woods, common, especially in primeval spruce and fir forests.—Pittsburg, First Lake, *P.* 11006 = *M.* 4595 (1907); (Stewartstown); Colebrook, *M.* 4004 (1907); (Columbia); (Millsfield); Stratford, *P.* 13444 (1912); (Stark); Dummer, *F. & P.* 16647 (1917); (Milan); (Success); (Dalton); Whitefield, *Deane* (1895); Carroll, Crawford's, *Miss S. Minns* (1888); Randolph, *M.* 982 (1903), *P.* 10214 (1907); (Gorham); Shelburne, *Deane* (1881, 1882, 1883, 1884, 1916); Low & Burbank Grant, *P.* 12331 (1909); (Sargent Purchase); Mt. Washington, not definitely located, *F. Boott* (no date); (Pinkham Grant); (Bean Purchase).

Oxalis montana Raf., f. **rhodantha** Fern. (*Rhod.* 23 (1920), 144). Rare.—Low & Burbank Grant, near Crag Camp, *H. St. John* (1911); Randolph, Sylvan Way, *P.* 19178 (1923).

Oxalis europaea Jordan (*O. corniculata* of *Manual*, not L.; *cf. Rhod.* 21 (1919), 79). Lady's Sorrel. Common weed.—Pittsburg, *P.* 10989 = *M.* 3742, 1775 (1907); Stewartstown, *P.* 10967 (1907); Stratford, *P.* 13592 (1912); Milan, *P.* 13805 (1912); Whitefield, *Deane* (1896), *P.* 11698 = *M.* 4338 (1908); Jefferson,

Mrs. E. H. Terry (1902); Randolph, *Williams* (1896), *M.* 343 (1902), *P.* 11219 (1909), *M.* 4599 (1913), *P.* 17611 (1919); Gorham, *P.* 16607 (1915); Martin Location, *P.* 14297 (1913); Shelburne, *Deane* (1882, 1913, 1916).

Oxalis corniculata L. (*O. repens* Thunb.; *cf. Rhod.* 21 (1919), 79). Rare garden weed.—Randolph, *P.* 17133 (1918).

GERANIACEAE (GERANIUM FAMILY).

GERANIUM [Tourn.] L. Cranesbill.

Geranium Robertianum L. Herb Robert. Rocky woods, local.—Lancaster, Mt. Prospect, *P.* 14586 (1913); Shelburne, *Deane* (1883, 1914).

Geranium Bicknellii Britton. Clearings, etc., infrequent.—Lancaster, Mt. Prospect, on ballast, *P.* 14544 (1913); Hadley Grant, Hart Ledge, *P.* 16636 (1915).

ERODIUM L'Hér. Storksbill.

Erodium cicutarium (L.) L'Hér. Rarely adventive.—Shelburne, *Deane* (1904).

TROPAEOLACEAE.

TROPAEOLUM L. Nasturtium.

Tropaeolum majus L.—Shelburne, self-sown, *Deane* (1918).

POLYGALACEAE (MILKWORT FAMILY).

POLYGALA [Tourn.] L. Milkwort.

Polygala sanguinea L. Grass-land, rare.—Shelburne, *Mrs. A. G. Balch & Miss M. S. Tappan* (1920).

EUPHORBIACEAE (SPURGE FAMILY).

EUPHORBIA L. Spurge.

Euphorbia serpyllifolia Pers. Adventive in western feed, rare.—Randolph, *P.* 18138 (1921).

Euphorbia glyptosperma Engelm. Rarely adventive, probably in feed.—Carroll, railroad track at Carroll Tank, *P.* 16591 (1915); Gorham, *P.* 17087 (1917).

Euphorbia hirsuta (Torr.) Wieg. Not infrequently adventive along railroad ballast.—Columbia, *P.* 17718 (1919); Stark, *P.* 12761 (1910); Dummer, *P.* 13951 (1912); Berlin, *P.* 11523 = *M.* 4483 (1908); Dalton, Scott Junction, *P.* 12279 (1909); Whitefield, *P.* 16069 (1914); Carroll, Twin Mt., *P.* 12697 (1910); Gorham, *P.* 11486 (1908); Shelburne, *Deane* (1882, 1883).

Euphorbia maculata L. Waste places, occasional.—(Colebrook); (Columbia); Lancaster, *P.* 12161 (1909); Whitefield, *P.* 11616 = *M.* 4343 (1908); Jefferson, *P.* 11432 (1908); Gorham, *P.* 11487 (1908); Berlin, *P.* 11310, 11765 = *M.* 4329 (1908); Shelburne, *P.* 11651 (1908).

Euphorbia corollata L. Flowering Spurge. Rarely adventive.—Randolph, near Appalachia station, *A. W. Evans* (1917), *P.* 17192 (1918; still persistent and spreading in 1923).

Euphorbia Helioscopia L. Wartweed. Rarely adventive.—Berlin, waste ground, *P.* 11794 = *M.* 4494 (1908).

Euphorbia Cyparissias L. Cypress Spurge. Persistent and spreading around cemeteries, etc.—Colebrook, *P.* 10843 = *M.* 3990 (1907); Stratford, *P.* 13630 (1912); Stark, *P.* 12769 (1910); Milan, *P.* 14004 (1912); Randolph, *Williams* (1897), *P.* 831 (1902), *M.* 1000 (1903); Shelburne, *Deane* (1909, 1910, 1911), *Mrs. G. N. McMillan* (1910). The Shelburne plants have well-developed fruit.

Euphorbia Peplus L. Rarely adventive.—Whitefield, *Deane* (1897).

CALLITRICHACEAE (WATER STARWORT FAMILY).

CALLITRICHE L. Water Starwort.

Callitriche palustris L. Shallow water and muddy ground, frequent.—Pittsburg, First Lake, *W. C. Kendall, E. L. Goldsborough, & A. Doolittle* (1904), *P.* 16526 (1915); (Millsfield); Errol, near Akers Pond, *F. & P.* 17075 (1917); Stratford, Nash Stream, *P.* 16302 (1914); Berlin, outlet of Head Pond, *P.* 17827 (1920); Whitefield, *P.* 11536 (1908); Randolph, *P.* 4170, 4171 (1904), 11187 (1908); Gorham, *P.* 16863 (1916); Shelburne, *Deane* (1918).

EMPETRACEAE (CROWBERRY FAMILY).

EMPETRUM [Tourn.] L. Crowberry.

Empetrum nigrum L. Mountain summits, especially on the higher peaks, common.—Success, Mt. Success, *P.* 11167 = *M.* 4124 (1908); Low & Burbank Grant, Ravine of the Castles, *M.* 387 (1902); Thompson & Meserve Purchase, Howker Ridge, *P.* 4050 (1904), Madison Huts, *P.* 10237 (1907), Mt. Clay, *Williams* (1898), Carriage Road, *Deane* (1882, 1884), *E. & C. E. Faxon* (1886), Cape Horn, *B. L. Robinson* (1901); Sargent Purchase, Alpine Garden, *E. & C. E. Faxon* (1878, 1879), *Williams* (1896, 1898), summit of Mt. Washington, *E. D. Merrill* (1896), Lakes of the Clouds, *Williams* (1893); Mt. Washington, not definitely located, *F. Boott* (1816), *W. Boott* (1855), *E. Faxon*, *W. F. Flint & J. H. Huntington* (1876), *A. Fairbanks* (1883), *J. M. Greenman* (1898); alpine region, not definitely located, *Oakes* (no date), *H. Mann* (1862), *C. G. Pringle* (1877).

Empetrum atropurpureum Fern. & Wieg. (*E. nigrum* L., var. *andinum* of *Manual*, not DC.) Exposed ledges and gravel on mountain summits, but usually not on the highest peaks, frequent.—Success, Mt. Success, *P.* 11165 (1908); Shelburne, Shelburne Moriah Mt., *Miss A. W. Christensen & Miss C. A. Gauthier* (1917); Bean Purchase, Carter Notch, *W. Boott* (1855), *P.* 4085, 4086 (1904); Thompson & Meserve Purchase, *P.* 12842 (1910), Mt. J. Q. Adams, *P.* 10876 (1907), Lowe's Bald Spot, *P.* 17497 (1919), Carriage Road, *F. & P.* 16746 (1917); alpine region, not definitely located, *Oakes* (no date), *J. W. Chickering* (1862); Bean Grant, Mt. Webster, *P.* 11784 (1908); Hadley Grant, *P.* 11460 (1908).

ANACARDIACEAE (CASHEW FAMILY).

RHUS L. Sumach.

Rhus typhina L. Staghorn Sumach. Dry ground, frequent.—Columbia, *P.* 10903 = *M.* 3921 (1907); (Stratford); (Stark); (Northumberland); (Berlin); Lancaster, *P.* 16741 (1916); Dalton, *M.* 5006 (1913); (Jefferson); Randolph, *Williams* (1897), *P.* 5691 (1904); Gorham, *M.* 4054 (1907); Shelburne, *Deane* (1882, 1883), *Williams* (1895), *Deane* (1916).

Rhus typhina L., f. **laciniata** (Wood) Rehder. Rare.—Shelburne, near Gates Cottage, *Deane* (1918).

Rhus glabra L. Smooth Sumach. Roadsides, etc., infrequent.—Colebrook, *P.* 10894 = *M.* 3882 (1907); Jefferson, *P.* 11436 (1908); Randolph, *Williams* (1895, 1896).

Rhus Toxicodendron L. Poison Ivy. Introduced occasionally along roads, railroads, and in alluvial soil; locally native on shaded rocky talus slopes; the two forms are perhaps distinct.—(Stratford); Stark, Devil's Slide, *P.* 17465 (1919); (Lancaster, Mt. Prospect); Randolph, Ice Gulch, *P.* 11499 (1908), 12872 (1910), 16705 (1917); Berlin, *P.* 11641 = *M.* 4509 (1908); Gorham, *P.* 10711 (1907), *M.* 4284 (1908); Shelburne, *Deane* (1883), *P.* 11204 = *M.* 4156, 4177 (1908), *P.* 12249 (1909), *Deane* (1916).

AQUIFOLIACEAE (HOLLY FAMILY).

ILEX L. Holly.

Ilex verticillata (L.) Gray. Low grounds, frequent.—Errol, Lake Umbagog, *P.* 10505 (1907); Cambridge, Lake Umbagog, *P.* 16539 (1915), 18155 (1921); (Stark); Northumberland, *P.* 12120 (1909), *F. & P.* 17017 (1917); Lancaster, *P.* 17258 (1918), 17814, 17817 (1920); Dalton, Forest Lake, *P.* 17569 (1919), 19047 (1922); Whitefield, *Deane* (1896), *P.* 11554 = *M.* 4388 (1908); (Jefferson); Randolph, *P.* 11195 (1908), 17601 (1919); Shelburne, *Deane* (1882, 1916).

Ilex verticillata (L.) Gray, var. **tenuifolia** (Torr.) Wats. Wet woods, occasional.—Colebrook, cedar bog, *F. & P.* 16711 (1917); Stark, *P.* 17441 (1919), Christine Lake, *P.* 18091 (1920); Dalton, Forest Lake, *P.* 17573 (1919), cedar bog, *P.* 17839 (1920); Jefferson, Mud Pond, *P.* 18075 (1921).

NEMOPANTHUS Raf. Mountain Holly.

Nemopanthus mucronata (L.) Trel. Damp woods and open ledges, common.—Pittsburg, Second Lake, *P.* 10319 = *M.* 3439 (1907); Dartmouth College Grant, *P.* 16237 (1914); (Millsfield); Dixville Notch, *Williams* (1895); (Columbia); Stratford, *P.* 13480 (1912); (Stark); (Northumberland); Milan, *P.* 13859 (1912); (Success); (Berlin); Dalton, *P.* 17546 (1919), 17859

(1920); (Jefferson); Randolph, *P.* 844 (1902), *M.* 3333 (1907); (Gorham); Shelburne, *Deane* (1881, 1882, 1883); (Low & Burbank Grant); Thompson & Meserve Purchase, Lowe's Bald Spot, *P.* 17499 (1919); (Sargent Purchase); Hadley Grant, Mt. Crawford, *P.* 11785 (1908); (Pinkham Grant); Bean Purchase, North Baldface Mt., *P.* 16049 (1914).

CELASTRACEAE (STAFF TREE FAMILY).

CELASTRUS L. Bittersweet.

Celastrus scandens L. Rocky talus and alluvial thickets, local.—Stark, Devil's Slide, *P.* 17468 (1919); Shelburne, *Deane* (1903), *P.* 11201 (1908).

ACERACEAE (MAPLE FAMILY).

ACER [Tourn.] L. Maple.

Acer pennsylvanicum L. Striped Maple; Moosewood. Rich woods, common.—Pittsburg, Third Lake, *M.* 3481 (1907); (Columbia); (Millsfield); (Stark); (Success); (Berlin); (Lancaster); (Dalton); Whitefield, *Deane* (1895); (Carroll); Randolph, *Williams* (1897), *P.* 849 (1901), *Mrs. G. F. Moore* (1905); (Gorham); Shelburne, *Deane* (1881, 1883), *Williams* (1895); (Low & Burbank Grant); (Thompson & Meserve Purchase); (Sargent Purchase); (Pinkham Grant); (Bean Purchase).

Acer spicatum Lam. Mountain Maple. Moist woods and in new growth, very common.—Pittsburg, near Third Lake, *P.* 10302 = *M.* 3501 (1907), First Lake, *M.* 3529 (1907); Dartmouth College Grant, *P.* 16159 (1914); (Stewartstown); Colebrook, *P.* 10890 = *M.* 4029, 3978 (1907); Columbia, *P.* 10494 (1907); (Millsfield); Stratford, *P.* 13499 (1912); (Stark); Dummer, *F. & P.* 16550 (1917); (Success); (Berlin); (Lancaster); (Dalton); Whitefield, *Deane* (1895, 1897); (Carroll); Jefferson, *W. Boott* (1873), *P.* 16880 (1916); Randolph, *Williams* (1897), *M.* 971, 1040, 1469 (1903), 1921 (1904), 3265 = *P.* 10050 (1907); Gorham, *Deane* (1883); Shelburne, *Deane* (1882, 1916), *C. E. Faxon* (no date); (Low & Burbank Grant); (Thompson & Meserve Purchase); (Sargent Purchase); Bean Grant, Southern Peaks, *M.* 1080 (1903); (Pinkham Grant); (Bean Purchase).

Acer saccharum Marsh. Sugar or Rock Maple. Upland woods, very abundant.—Pittsburg, First Lake, *P.* 10178 = *M.* 3528 (1907); (Colebrook); (Millsfield); (Stratford); (Stark); (Northumberland); Milan, *P.* 13741 (1912); (Berlin); Lancaster, *Deane* (1896); (Carroll); (Jefferson); (Low & Burbank Grant); Randolph, *P.* 11517 (1908); (Gorham); Shelburne, *Deane* (1883).

Acer saccharinum L. Silver Maple. Banks of the larger rivers, frequent.—Wentworth Location, *P.* 12584 (1910); Gorham, *M.* 4057 (1907), *P.* 16083 (1914); Shelburne, *Deane* (1883), *P.* 11161 = *M.* 4138 (1908), *Deane* (1916); (Stewartstown); Stratford, *P.* 13580 (1912); Northumberland, *P.* 12261 (1909); Stark, Percy, *P.* 14149 (1913); Lancaster, Coös Junction, *P.* 12106 (1909).

Acer rubrum L. Red Maple. Low woods, common.—Pittsburg, First Lake, *P.* 10179 = *M.* 3530 (1907); (Columbia); Cambridge, Lake Umbagog, *P.* 16538, 18153 (1915); (Stratford); (Stark); (Northumberland); (Success); (Berlin); (Kilkenny); Whitefield, *Deane* (1895); (Carroll); (Jefferson); Randolph, *M.* 1452, 1453 (1903), *Mrs. G. F. Moore* (1905), *P.* 11529 (1908); (Gorham); Shelburne, *A. E. Philbrook*, *Deane* (1883); Bean Purchase, Wild River valley, *P.* 16017 (1914); (Pinkham Grant); (Low & Burbank Grant); (Thompson & Meserve Purchase).

Acer Negundo L. Box Elder. Alluvial soil in the Connecticut valley, occasional.—Columbia, *P.* 10105 = *M.* 3405 (1907); Stratford, *F. & P.* 17020 (1917); Lancaster, *P.* 17101 (1918); Whitefield, north of Whitefield Junction, *P.* 16085 (1914).

BALSAMINACEAE (TOUCH-ME-NOT FAMILY).

IMPATIENS [Rivinius] L. Jewelweed; Touch-me-not.

Impatiens pallida Nutt. Pale Jewelweed. Rich woods, locally abundant northward.—Pittsburg, near Camel's Rump, *P.* 19106 (1922); Millsfield, *P.* 18161 (1921); Dixville, west of The Balsams, *P.* 10561 (1907); Lancaster, Mt. Prospect, *P.* 809 (1900). The following are of the unspotted form: Dixville, *Deane* (1917); Stark, Devil's Slide, *P.* 17467 (1919).

Impatiens pallida Nutt., var. **speciosa** Jennings (*Ohio Journ. Sci.* 20 (1920), 204). Locally abundant.—Millsfield, path to Camp Millsfield, *P.* 18162 (1921).

Impatiens biflora Walt. Spotted Jewelweed. Damp places, especially in shade, common.—(Pittsburg); (Stewartstown); Colebrook, *P.* 10888 = *M.* 3924 (1907); (Columbia); (Millsfield); (Stratford); (Stark); (Northumberland); (Milan); (Lancaster); Whitefield, *Deane* (1897), *M.* 5028 (1913); Jefferson, *M.* 132 (1901), *P.* 10742 (1907); Randolph, *Williams* (1895), *M.* 241, 394, *P.* 810 (1902), *P.* 12887, 12888 (1910); (Gorham); Shelburne, *Deane* (1884); (Bean Purchase); (Pinkham Grant); (Low & Burbank Grant).

Impatiens biflora Walt., f. **Peasei** A. H. Moore (*Rhod.* 19 (1917), 116; 21 (1919), 98–99). Local.—Pittsburg, near Camel's Rump, *P.* 19105 (1922); Whitefield, near Forest Lake, *P.* 14556 = *M.* 5028 (1913), the type specimen; Jefferson, near Highlands station, *Miss E. W. Cook* (1901), *P.* 10741 (1907).

RHAMNACEAE (BUCKTHORN FAMILY).

RHAMNUS [Tourn.] L. Buckthorn.

Rhamnus alnifolia L'Hér. Open bogs, local.—Milan, near Marston station, *P.* 13847 (1912), 14120 (1913); Whitefield, near Bethlehem line, by railroad, *P.* 17508 (1919).

VITACEAE (VINE FAMILY).

PSEDERA Neck. Woodbine; Virginia Creeper.

Psedera vitacea (Knerr) Greene. Alluvial or rocky woods, frequent.—Pittsburg, Indian Stream, *M.* 3732 (1907); Stewartstown, *P.* 10453 = *M.* 3694 (1907); (Stratford); Northumberland, Cape Horn, *P.* 16475 (1917); Stark, Devil's Slide, *P.* 17462 (1919); Milan, Cedar Pond, *P.* 14003 (1912); Lancaster, Mt. Prospect, *P.* 14204 (1913); Gorham, *P.* 11457 (1908), 12248 (1909); Shelburne, *P.* 11331 = *M.* 4152 (1908), *Deane* (1917).

VITIS [Tourn.] L. Grape.

Vitis novae-angliae Fern. (*Rhod.* 19 (1917), 144–147). Alluvial or rocky thickets, local.—Stark, Devil's Slide, *P.* 17439

(1919); Gorham, *P.* 17409 (1919); Shelburne, *Deane* (1882, 1907), *P.* 10798 (1907), *M.* 4159 (1908), *P.* 16908 (1916), 17787 (1919).

TILIACEAE (LINDEN FAMILY).

TILIA [Tourn.] L. Linden; Basswood.

Tilia americana L. Rich woods, frequent.—(Stratford); (Stark); Lancaster, *P.* 16727 (1916); (Dalton); (Carroll); Jefferson, *P.* 16399 (1915); Randolph, *P.* 10613 (1907); Gorham, *P.* 16359 (1915); Shelburne, *Deane* (1882), *A. P. Briggs* (1883), *M.* 4174, *P.* 11676 (1908), *Deane, Miss A. P. Lowell* (1914).

MALVACEAE (MALLOW FAMILY).

MALVA [Tourn.] L. Mallow.

Malva rotundifolia L. Cheeses. Barnyards, etc., infrequent.—(Stark); Gorham, *P.* 12796 (1910), 16328 (1914); Shelburne, *Deane* (1918).

Malva crispa L. Curled Mallow. Rare escape.—Jefferson, *P.* 16897 (1916).

Malva moschata L. Musk Mallow. Frequently persistent or spreading.—Pittsburg, near Indian Stream, *P.* 11063 = *M.* 3734 (1907); Colebrook, *P.* 860 (1901), 10372 = *M.* 3883, 3974 (1907); Cambridge, *Williams* (1906), *R. A. Ware* (1922); Berlin, *P.* 17334 (1918); Carroll, *P.* 17433 (1919); Randolph, *P.* 12079 (1909); Martin Location, *P.* 19136 (1922); Gorham, *M.* 4266 (1908); Shelburne, *Deane* (1919).

HYPERICACEAE (ST. JOHN'S-WORT FAMILY).

HYPERICUM [Tourn.] L. St. John's-wort.

Hypericum perforatum L. Common St. John's-wort. Frequently adventive in fields, etc.—Columbia, *P.* 10471 = *M.* 3878 (1907); Milan, *P.* 13724 (1912); (Lancaster); (Dalton); (Jefferson); Randolph, *Williams* (1895), *M.* 240 (1902), *P.* 9912 (1906); Martin Location, *P.* 12851 (1910); Gorham, *P.* 16933 (1916); Shelburne, *Deane* (1882, 1883, 1914).

Hypericum ellipticum Hook. Wet places, frequent.—Pittsburg, west of Indian Stream, *P.* 10948 (1907); Colebrook, *M.* 3987 (1907); Northumberland, *P.* 12138 (1909); Milan, *P.* 13804

(1912); Carroll, *P.* 14385 (1913), Twin Mt., *P.* 17563 (1919), Fabyans, *E. & C. E. Faxon* (1891), Crawford's, *Williams* (1895); Randolph, *J. R. Churchill* (1889), *Williams* (1896), *M.* 239 (1902), *P.* 11554 (1908); Martin Location, *P.* 14310 (1913); Shelburne, *Deane* (1882, 1883, 1913, 1914).

Hypericum boreale (Britton) Bicknell. Margins of ponds and slow streams, occasional.—Errol, *F. & P.* 16984 (1917); Berlin, Head Pond, *P.* 13850 (1912); Lancaster, Israel River, *P.* 12800 (1910); Whitefield, *Deane* (1896, 1897), Burns Pond, *P.* 14558 = *M.* 5040 (1913), *P.* 17791 (1919); Carroll, Crawford's, *Williams* (1895); Jefferson, Little Cherry Pond, *P.* 12931 (1910); Shelburne, river bank, *Deane* (1914).

Hypericum mutilum L. Low ground, common.—Pittsburg, *F. & P.* 16959 (1917); Colebrook, *F. & P.* 16583 (1917); (Cambridge); (Berlin); Jefferson, *P.* 16819 (1916); Randolph, *Williams* (1895), *P.* 12351 (1909); (Gorham); Shelburne, *Deane* (1883, 1914, 1916).

Hypericum majus (Gray) Britton. Sandy soil, etc., frequent.—Colebrook, *P.* 10920 = *M.* 4003 (1907); Milan, *P.* 13729 (1912); Whitefield, *Deane* (1896, 1897); Carroll, Fabyans, *E. & C. E. Faxon* (1895), Crawford's, *E. & C. E. Faxon* (1895); (Jefferson); Randolph, *Williams* (1896), *P.* 4175, 4176 (1904); Shelburne, *Deane* (1915, 1916).

Hypericum canadense L. Ditches, etc., occasional.—Carroll, *P.* 14383 (1913), Fabyans, *E. & C. E. Faxon* (1895), Crawford's, *E. & C. E. Faxon*, *Williams* (1895); Randolph, *Williams* (1895, 1896), *P.* 10766 (1907), 12231 (1909); Martin Location, *P.* 14350 (1913); Shelburne, *Deane* (1916).

Hypericum virginicum L. Marsh St. John's-wort. Swamps and borders of ponds, frequent.—(Clarksville); Cambridge, Lake Umbagog, *P.* 16558 (1915), 18186 (1921); (Stratford); (Northumberland); (Stark); Dummer, *Williams* (1895); (Success); (Lancaster); Dalton, *M.* 4374 (1908), *P.* 17565 (1919); Whitefield, *Deane* (1896), *M.* 5039 (1913); Jefferson, *W. Boott* (1873); Randolph, *P.* 4026 (1904), 9906 (1906); Shelburne, *Deane* (1882, 1883).

CISTACEAE (ROCKROSE FAMILY).

LECHEA [Kalm] L. Pinweed.

Lechea intermedia Leggett (including var. *juniperina* (Bicknell) Robinson). Frequent in the southern part of the County.—Dalton, *P.* 11467 = *M.* 4366 (1908); Jefferson, *P.* 11415 (1908); Randolph, *Williams* (1895), *P.* 9907 (1906), *M.* 4463 (1908), *P.* 16799, 16938 (1916); Gorham, *M.* 4273, *P.* 11467 (1908); Shelburne, *E. & C. E. Faxon* (1886), *Deane* (1884, 1902, 1907, 1913), *P.* 11668 (1908); Bean Purchase, lumber railroad near Moriah Brook, *P.* 16029 (1914).

VIOLACEAE (VIOLET FAMILY).

VIOLA [Tourn.] L. Violet.

Viola cucullata Ait. Wet places, common.—(Pittsburg); (Northumberland); Berlin, *P.* 11630 (1908); (Jefferson); Carroll, *P.* 14399 (1913), Crawford's, *Williams* (1898); Randolph, *Mrs. G. F. Moore* (1905), *M.* 3262, *P.* 10059 (1907), 12014 (1909), 12780 (1910); Gorham, *Deane* (1909); Shelburne, *Deane* (1883, 1903, 1909); Green Grant, *P.* 17113 (1918).

Viola cucullata Ait., f. **prionosepala** (Greene) Brainerd (*Rhod.* 15 (1913), 112). Occasional.—Randolph, *P.* 5746 (1904); Shelburne, *Deane* (1914); Sargent Purchase, Tuckerman Ravine, *H. E. Sargent* (1901).

Viola cucullata × **septentrionalis.** Infrequent.—Shelburne, *Deane* (1909, 1910, 1914).

Viola nephrophylla Greene. Damp rocks, etc., local.—Colebrook, Beaver Falls, *F. & P.* 16741 (1917); Shelburne, *Deane* (1919).

Viola septentrionalis Greene. Woods, common.—Dartmouth College Grant, *P.* 16228 (1914); Stewartstown, *F. & P.* 15557 (1917); Colebrook, *F. & P.* 16567, 16709 (1917); (Columbia); Stratford, *P.* 13460, 13585 (1912), *F. & P.* 16743 (1917); (Stark); (Dummer); Northumberland, *P.* 12142 (1909); (Success); Lancaster, *S. N. F. Sanford* (1914); Dalton, *P.* 12370 (1909); Jefferson, *P.* 16495 (1917); Randolph, *P.* 12184, 12194, 12281 (1909), 16436 (1917); Gorham, *P.* 12194 (1909), 14183 (1913); Shelburne,

Deane (1883, 1909, 1910, 1919), *Miss E. Evans* (1904), *Miss R. K. Stowell* (1916); (Thompson & Meserve Purchase).

Viola novae-angliae House. Rare, and perhaps needing further study.—Shelburne, *Deane* (1919).

Viola fimbriatula Sm. Railroad ballast, rarely adventive.—Berlin, *P.* 16518 (1915); Randolph, *P.* 17610 (1919); Whitefield, *P.* 11425 (1908).

Viola Selkirkii Pursh. Rich woods, especially under sugar-maple trees, frequent.—Dartmouth College Grant, *P.* 16221 (1914); Millsfield, *P.* 18159 (1921); Colebrook, *P.* 11074 = *M.* 3789 (1907); Stratford, *P.* 13505 (1912); (Stark); Milan, *P.* 17119 (1918); Success, *P.* 16534 (1917); Carroll, *P.* 16666 (1916), 17422 (1919), Mt. Deception, *P.* 11446 (1908); Jefferson, *P.* 18214 (1921); Randolph, *Williams* (1896), *P.* 11147 (1908), 12227 (1909), 16653 (1917); (Gorham); Shelburne, *Deane* (1909); Bean Grant, Mt. Clinton, *E. & C. E. Faxon* (1878, 1881).

Viola palustris L. Alpine brooks, frequent.—Low & Burbank Grant, Salmacis Fall, *L. A. Wardwell* (1906), Snyder Brook, *P.* 10212 (1907); Thompson & Meserve Purchase, Great Gulf, *E. & C. E. Faxon* (1886, 1887); Sargent Purchase, Alpine Garden, *A. Preble* (1898), Tuckerman Ravine, *H. Mann* (1862), *E. & C. E. Faxon* (1885, 1886), *Williams* (1897), *W. W. Eggleston* (1897, 1898, 1901), *M.* 1074 (1903), *P.* 12050 = *M.* 4579 (1909); Mt. Washington, not definitely located, *W. F. Flint & J. H. Huntington* (1876), *J. A. Allen* (1878), *W. G. Farlow* (1884); Cutts Grant, Oakes Gulf, *F. H. Horsford* (1878), *Williams* (1893, 1898), *J. M. Greenman* (1898), *P.* 11139 (1908), *M.* 4548 (1909); alpine region, not definitely located, *Oakes* (no date), *C. G. Pringle* (1877, 1879).

Viola pallens (Banks) Brainerd. Sweet White Violet. Wet places, common.—(Pittsburg); Colebrook, *P.* 11042 (1907); Stratford, *P.* 13595 (1912); (Success); Carroll, *P.* 11259 (1908); Randolph, *M.* 1052 (1903), *P.* 4067, 4073, 4182 (1904), *Mrs. G. F. Moore* (1905), *L. A. Wardwell* (1906), *M.* 3261, *P.* 10026 (1907), 11236 (1908); Gorham, *Deane* (1909); Shelburne, *Deane* (1904, 1909, 1910, 1916); Sargent Purchase, Tuckerman Ravine, *P.* 893 (1902), 11546 (1908).

Viola incognita Brainerd. Moist woods, common.—Pittsburg, near Third Lake, *M.* 3509 (1907), Second Lake, *P.* 10218 (1907), First Lake, *Mrs. A. F. Stevens* (1895), *P.* 10125 = *M.* 3591 (1907); Dartmouth College Grant, *P.* 16226 (1914); Colebrook, *P.* 11049 = *M.* 3793 (1907); Stratford, *P.* 13504 (1912); (Success); Whitefield, *Deane* (1895); (Carroll); Crawford Purchase, *P.* 11273 (1908); (Jefferson); Randolph, *P.* 5378, 6401 (1904), *Mrs. G. F. Moore* (1905), *P.* 10760 (1907), 11281 (1908); Shelburne, *Deane* (1909, 1910, 1913); Martin Location, *P.* 14265 (1913); Low & Burbank Grant, *P.* 16479 (1917).

Viola renifolia Gray. Cool woods, frequent.—Pittsburg, First Lake, *P.* 10124 = *M.* 3606 (1907); Dartmouth College Grant, *P.* 16224 (1914); Stewartstown, *F. & P.* 16678 (1917); Colebrook, *P.* 11075 = *M.* 3794 (1907), *P.* 13866 (1912); Stratford, *P.* 13600 (1912); Northumberland, *P.* 16471 (1917); Lancaster, *P.* 12828 (1910); Dalton, *P.* 11594 = *M.* 4436 (1908); Whitefield, *Deane* (1895); Shelburne, *Deane* (1909, 1919).

Viola renifolia Gray, var. **Brainerdii** (Greene) Fern. (*Rhod.* 14 (1912), 86–88). Similar localities, frequent.—Stewartstown, *P.* 10260 = *M.* 3412 (1907); Colebrook, *P.* 13867 (1912); Stratford, *F. & P.* 16742 (1917); Milan, *P.* 13737 (1912), 14274 (1913); Berlin, *P.* 16501 (1915); Lancaster, *P.* 14524 (1913); Whitefield, *Deane* (1895); Carroll, *P.* 17423 (1919); Jefferson, *P.* 16872 (1916); Randolph, *M.* 1440 (1903), *P.* 10855 (1907), 11285 (1908), 16295 (1914); Gorham, *P.* 11242 (1908); Shelburne, *Deane* (1909, 1910).

Viola rotundifolia Michx. Early Yellow Violet. Cool woods, common southward.—Stratford, *P.* 13443 (1912); (Stark); (Northumberland); Lancaster, *P.* 14273 (1913), *S. N. F. Sanford* (1914); Carroll, *P.* 17427 (1919); (Jefferson); (Low & Burbank Grant); Randolph, *Williams* (1896), *P.* 4143 (1904), 9900 (1906), *M.* 3256 (1907); (Gorham); Shelburne, *Deane* (1884, 1909); (Bean Purchase); (Sargent Purchase).

Viola pubescens Ait. Downy Yellow Violet. Rich woods, rare.—Lancaster, Mt. Prospect, *P.* 16916 (1917).

Viola eriocarpa Schwein., var. **leiocarpa** Fernald & Wiegand (*V. scabriuscula* Schwein.; *cf. Rhod.* 23 (1921), 275–276). Smooth

Yellow Violet. Rich, especially alluvial, woods, frequent.—Clarksville, *P.* 11035 = *M.* 3715 (1907); Dixville, *P.* 10607 (1907); Colebrook, *P.* 11080 = *M.* 3818 (1907); Millsfield, *P.* 18193 (1921); Errol, *P.* 12615 (1910); Stratford, *P.* 13478 (1912); Northumberland, *P.* 12130 (1909); Lancaster, *P.* 12790 (1910), 14202 (1913); Dalton, *P.* 16407 (1915); (Jefferson); Randolph, *Mrs. G. F. Moore* (1905), *P.* 12080 (1909), 16297 (1914), 16444 (1917); Shelburne, *Deane* (1904, 1909).

Viola canadensis L. Canada Violet. Rich woods, frequent northward.—Colebrook Academy Grant, *P.* 14164 (1913); Atkinson & Gilmanton Academy Grant, Crystal Mt., *P.* 12627 (1910); Clarksville, *P.* 11034 = *M.* 3716 (1907); Dixville, *P.* 10624 (1907); Stewartstown, Little Diamond Pond, *P.* 12666 (1910); Colebrook, *P.* 11073 = *M.* 3810 (1907); Columbia, *F. & P.* 16586 (1917); Stratford, Sugarloaf Mt., *P.* 13477 (1912); Lancaster, Mt. Prospect, *P.* 14436 (1913), 16917 (1917).

Viola conspersa Reichenb. Woods, local.—Northumberland, *P.* 12129 (1909); Lancaster, Mt. Prospect, *P.* 16923 (1917); Shelburne, *Deane* (1910).

Viola labradorica Schrank. Heads of alpine ravines, local; at lower altitudes rare.—Columbia, near Lime Pond, *P.* 10437 (1907); Thompson & Meserve Purchase, above Great Gulf, *W. Boott* (1855); Sargent Purchase, Alpine Garden, *E. & C. E. Faxon* (1878), Huntington Ravine, 4000 feet, *F. & P.* 16756 (1917); Cutts Grant, Oakes Gulf, *E. & C. E. Faxon* (1881), *Williams* (1893, 1898), *J. M. Greenman* (1898), *P.* 11225 (1908), 12039 (1909); alpine region, not definitely located, *Oakes* (no date).

Viola adunca Sm. (*V. arenaria* of *Manual; cf. Rhod.* 15 (1913), 106–111). Rare.—Gorham, *P.* 11484 (1908).

Viola tricolor L. Heart's Ease; Ladies' Delight. Escaped from gardens, etc.—Jefferson, Cherry Mt. station, *P.* 16638 (1915); Randolph, *M.* 342 (1902), *P.* 12255 (1909), 16497 (1917); Gorham, *M.* 4262 (1908); Martin Location, *P.* 17211 (1918). A specimen collected in Whitefield by *Deane* (1919) is described by Dr. E. Brainerd as belonging to a 'species allied to *V. tricolor*.'

THYMELAEACEAE (MEZEREUM FAMILY).

DIRCA L. Leatherwood.

Dirca palustris L. Moist woods, local.—Lancaster, Mt. Prospect, *P.* 14222 (1913), Mt. Pleasant, *F. A. Shute* (1918).

ONAGRACEAE (EVENING PRIMROSE FAMILY).

LUDVIGIA L.

Ludvigia palustris (L.) Ell. Water Purslane. Muddy shores, rare.—Dalton, *P.* 11599 (1908); Jefferson, Little Cherry Pond, *P.* 12933 (1910).

EPILOBIUM [Dill.] L. Willow-herb.

Epilobium angustifolium L. Swamps, clearings, and burnt land, common.—Pittsburg, First Lake, *M.* 3645 (1907); Dartmouth College Grant, *P.* 16238 (1914); Colebrook, *P.* 10898 = *M.* 4018, 3873 (1907); (Columbia); (Cambridge); (Stratford); (Stark); (Success); (Berlin); Lancaster, *P.* 16919 (1917); (Carroll); (Jefferson); Randolph, *Williams* (1895, 1896), *M.* 206 (1902); (Gorham); Shelburne, *Deane* (1882, 1883); (Low & Burbank Grant); Thompson & Meserve Purchase, Cape Horn, *Williams* (1897); Sargent Purchase, Huntington Ravine, *F.* & *P.* 16853 (1917), Tuckerman Ravine, *P.* 11491 (1908), *M.* 5086 (1913); Cutts Grant, Oakes Gulf, *Williams* (1895); (Bean Purchase).

Epilobium angustifolium L., f. **albiflorum** (Dumort.) Haussk. (*Rhod.* 23 (1921), 115). Infrequent.—Success, *P.* 16261 (1914); Gorham, Mt. Hayes, *P.* 12814 (1910).

Epilobium molle Torr. Bogs and wet meadows, frequent.—Stewartstown, *P.* 13945 (1912); (Colebrook); Columbia, *P.* 13979 (1912); Milan, *P.* 13701 (1912); Jefferson, *P.* 11430 (1908); Randolph, *P.* 923 (1902); Martin Location, *P.* 14298 (1913).

Epilobium densum Raf. Swamps, etc., common.—(Stewartstown); Colebrook, *P.* 13941 (1912); Columbia, *W. Boott* (1855); (Northumberland); Milan, *P.* 13731, 13737 (1912); (Berlin); Lancaster, *P.* 12151 (1909), 17145 (1918); Dalton, *P.* 12363 (1909); Whitefield, *P.* 14559 = *M.* 5041 (1913); Carroll, Crawford's, *Williams* (1895); Jefferson, *P.* 10808 (1907); Randolph,

Williams (1895), *P.* 928 (1900), 11685 (1908), *M.* 4583 (1909); Gorham, *P.* 16606 (1915); Green Grant, *P.* 13912 (1912).

Epilobium palustre L. Alpine ravines, etc., local.—Sargent Purchase, Alpine Garden and slopes toward Raymond Cataract, *E. & C. E. Faxon*, *Williams* (1897), Huntington Ravine, *F. & P.* 16852 (1917); Mt. Washington, not definitely located, *J. R. Churchill* (1890).

Epilobium palustre L., var. **labradoricum** Haussk. Similar localities, more frequent.—Low & Burbank Grant, King Ravine, *W. G. Farlow* (1882), *P.* 926 (1902), 12067 (1909); Sargent Purchase, Huntington Ravine, *F. & P.* 16858 (1917), Tuckerman Ravine, *W. W. Eggleston* (1899), *P.* 11504 (1909), Lakes of the Clouds, *J. A. Allen* (1880), *Williams*, *B. L. Robinson* (1901); Mt. Washington, not definitely located, *J. R. Churchill* (1890); alpine region, not definitely located, *Tuckerman* (1840), *A. Gray* (1842), *C. G. Pringle* (1878).

Epilobium palustre L., var. **monticola** Haussk. Alpine and lowland bogs and heads of ravines, occasional.—Colebrook, *F. & P.* 16949 (1917); Lancaster, Coös Junction, *P.* 12126 (1909); Randolph, near Pond of Safety, *P.* 12264 (1909); Carroll, Crawford's, *E. Faxon*, *Williams* (1895); Thompson & Meserve Purchase, Great Gulf, *E. & C. E. Faxon* (1898); Sargent Purchase, Lakes of the Clouds, *J. A. Allen* (1880), Raymond Cataract, *E. & C. E. Faxon* (1897).

Epilobium coloratum Muhl. Low ground, infrequent.—Whitefield, *Deane* (1897).

Epilobium glandulosum Lehm., var. **adenocaulon** (Haussk.) Fern. (*E. adenocaulon* Haussk.; *cf. Rhod.* 20 (1918), 35). Damp soil, common.—Pittsburg, First Lake, *Mrs. A. F. Stevens* (1895); (Stewartstown); Millsfield, *P.* 18166 (1921); Dummer, *Williams* (1895); (Stark); Milan, *P.* 13745 (1912); Lancaster, *S. N. F. Sanford* (1914); Whitefield, *Deane* (1896, 1897); Carroll, Fabyans, *E. & C. E. Faxon* (1891); Thompson & Meserve Purchase, Base Station, *E. & C. E. Faxon* (1891); (Jefferson); (Low & Burbank Grant); Randolph, *J. R. Churchill* (1889), *Williams* (1895), *P.* 925 (1900), *M.* 399 (1902), 4466 (1908), 4596 (1909); Gorham,

Deane (1882); Shelburne, *Deane* (1881, 1914); Pinkham Grant, *W. Boott* (no date).

Epilobium glandulosum Lehm., var. **occidentale** (Trel.) Fern. (*Rhod.* 20 (1918), 35). Less common.—Dartmouth College Grant, *P.* 16147 (1914); Thompson & Meserve Purchase, Base Station, *E. & C. E. Faxon* (1891); Pinkham Grant, *W. Boott* (1855).

Epilobium glandulosum Lehm., var. **perplexans** (Trel.) Fern. (*E. adenocaulon* Haussk., var. *perplexans* Trel.; *cf. Rhod.* 20 (1918), 35). Shaded cliffs, rare.—Randolph, Ice Gulch, *P.* 12875 (1910), 16650 (1917); Hadley Grant, Hart Ledge, *P.* 16618 (1915).

Epilobium lactiflorum Haussk. (*E. alpinum* of *Manual* not L.; *cf. Rhod.* 20 (1918), 37). Alpine brooks and ravines, occasional, but not always clearly differentiated from *E. Hornemanni* Reichenb.—Low & Burbank Grant, Castles Brook, *P.* 16712 (1916); Sargent Purchase, Tuckerman Ravine, *W. Boott* (1855), *E. S. Hoar* (1858), *E. & C. E. Faxon* (1890), *Williams* (1895), *P.* 12049 (1909); Cutts Grant, Oakes Gulf, *Williams* (1901); Mt. Washington, not definitely located, *W. F. Flint & J. H. Huntington* (1876); White Mountains, not definitely located, *C. G. Pringle* (1877).

Epilobium Hornemanni Reichenb. Cold mountain brooks, abundant at higher levels; see note on *E. lactiflorum*.—Randolph, Moose Brook below Ice Gulch, *P.* 12532 (1909); Low & Burbank Grant, near Hitchcock Fall, *P.* 17368 (1919), Valleyway, *P.* 3148 (1903), Salmacis Fall, *Williams* (1895), King Ravine, *P.* 12155 (1909), The Perch, *P.* 927 (1900); Thompson & Meserve Purchase, Jefferson Brook, *P.* 11191 (1908), Great Gulf, *E. & C. E. Faxon* (1890, 1897), *Williams* (1895); Sargent Purchase, Tuckerman Ravine, *C. G. Pringle* (1877), *E. & C. E. Faxon* (1890), *Williams* (1893), *E. D. Merrill* (1896), *P.* 11547 (1908), 12077 (1909), Alpine Garden, *E. & C. E. Faxon* (no date); Cutts Grant, Oakes Gulf, *E. & C. E. Faxon* (1890), *P.* 12025 (1909); near base of Mt. Washington, not definitely located, *H. E. Sargent* (1901); Bean Purchase, Nineteen Mile Brook, *P.* 12907 (1910).

OENOTHERA L. Evening Primrose.

Oenothera muricata L. Gravelly soil, frequent.—Colebrook, *P.* 10895 = *M.* 3926 (1907); Milan, *P.* 13854 (1912); Whitefield,

P. 14322 (1913); Jefferson, *P.* 12857 (1910); Randolph, *M.* 4880 (1911), *P.* 14473 (1913); Shelburne, *Deane* (1915, 1917, 1919).

Oenothera biennis L. Sandy or gravelly soil, common.—Stewartstown, *F. & P.* 15561, 17084 (1917); (Stark); (Northumberland); (Berlin); (Lancaster); Jefferson, *Mrs. E. H. Terry* (1902); (Carroll); Randolph, *Williams* (1895), *P.* 935 (1902), 5688 (1904), *M.* 4246 (1908), *P.* 12910, *M.* 4848 (1910), 4862, 4863, 4864 (1911), 4892, 4893 (1913); Gorham, *P.* 12246, 12247 (1909); Shelburne, *M.* 4875 (1911), *Deane* (1882, 1883, 1914); Martin Location, *P.* 17225 (1918).

Oenothera Lamarckiana Ser. Rare garden escape.—Shelburne, *Deane* (1919).

Oenothera perennis L. (*O. pumila* of *Manual; cf. Bull. Torr. Bot. Club*, 46 (1919), 372). Pastures, etc., common.—Pittsburg, near Canaan line, *P.* 11019 = *M.* 3751 (1907); (Clarksville); (Stewartstown); (Columbia); (Millsfield); (Stratford); Milan, *P.* 13716 (1912); (Success); (Berlin); (Dalton); Carroll, Crawford's, *Williams* (1895); Jefferson, *P.* 16403 (1915); Randolph, *M.* 207, *P.* 934 (1902), 3374 (1907); Shelburne, *Deane* (1915); Martin Location, *P.* 14340 (1913).

CIRCAEA [Tourn.] L. Enchanter's Nightshade.

Circaea latifolia Hill (*C. lutetiana* Am. authors, not L.; *cf. Rhod.* 19 (1917), 87). Rocky woods, local.—Stark, Devil's Slide, *P.* 17466 (1919); Shelburne, *Deane* (1884, 1916).

Circaea canadensis Hill (*C. intermedia* Ehrh.; *cf. Rhod.* 19 (1917), 87). Rich woods, local.—Lancaster, *P.* 12822 (1910).

Circaea alpina L. Moist woods, common.—Dartmouth College Grant, *P.* 16267 (1914); Clarksville, *M.* 3771 (1907); (Stewartstown); Colebrook, *P.* 11051 (1907); (Columbia); (Millsfield); (Stark); (Northumberland); (Success); Lancaster, *P.* 14328 (1913); (Dalton); Whitefield, *Deane* (1895); (Carroll); (Jefferson); Randolph, *M.* 288 (1902), *P.* 11185 (1908); (Gorham); Shelburne, *Deane* (1882, 1884, 1916); (Green Grant); Sargent Purchase, Gulf of Slides, *M.* 1425 (1903).

HALORAGIDACEAE (WATER MILFOIL FAMILY).

MYRIOPHYLLUM [Vaill.] L. Water Milfoil.

Myriophyllum alterniflorum DC. Lakes, rare.—Pittsburg, First Lake, *W. C. Kendall, E. L. Goldsborough, & A. Doolittle* (1904); Lancaster, Baker Pond, *P.* 17280 (1918).

Myriophyllum verticillatum L., var. **pectinatum** Wallr. Shallow pools, occasional.—Northumberland, Horseshoe Pond, *P.* 17271, 17272 (1918).

Myriophyllum Farwellii Morong. Shallow water, infrequent.—Pittsburg, First Lake, *W. C. Kendall, E. L. Goldsborough, & A. Doolittle* (1904); Stewartstown, *F. & P.* 17043 (1917).

Myriophyllum tenellum Bigel. Slow streams, rare.—Shelburne, *E. & C. E. Faxon* (1886).

ARALIACEAE (GINSENG FAMILY).

ARALIA [Tourn.] L.

Aralia racemosa L. Spikenard. Rich woods, frequent.—(Pittsburg); Colebrook, *P.* 10896 (1907); Columbia, *F. & P.* 16622 (1917); (Stratford); (Stark); Milan, *P.* 14064 (1912); Lancaster, *P.* 17725 (1919); Dalton, *M.* 5083 (1913); Randolph, *Williams* (1895, 1897), *P.* 945 (1902), *M.* 1384, 1385 (1903); (Gorham); Shelburne, *C. E. Faxon* (1872), *Deane* (1882, 1883, 1884, 1916).

Aralia hispida Vent. Bristly Sarsaparilla. Rocky, gravelly, or burned soil, common.—(Stratford); (Stark); (Milan); Success, *P.* 11780 = *M.* 4321 (1908); Berlin, Black Mt., *P.* 16111 (1914); (Kilkenny); (Whitefield); (Carroll); (Jefferson); Randolph, *Williams* (1897), *P.* 943, *M.* 225 (1902); Gorham, *Deane* (1882), *M.* 4063 (1907); Shelburne, *Deane* (1915); Bean Purchase, North Baldface Mt., *P.* 16043 (1914); Hadley Grant, Mt. Hope, *P.* 16457 (1915).

Aralia nudicaulis L. Wild Sarsaparilla. Woods, common.—Pittsburg, near Third Lake, *P.* 10308 (1907), First Lake, *M.* 3610 (1907); (Columbia); (Cambridge); Stratford, *P.* 13474 (1912); (Dummer); (Stark); (Northumberland); Milan, *P.* 13928

(1912); (Success); (Berlin); (Lancaster); (Dalton); Carroll, Bretton Woods, *C. E. Faxon* (1889); (Jefferson); Randolph, *M.* 1035 (1903), 3297 (1907), 4184, *P.* 11175 (1908); Gorham, *Williams* (1895); Shelburne, *Deane* (1883); (Martin Location); (Pinkham Grant); (Bean Purchase); (Low & Burbank Grant); (Thompson & Meserve Purchase); (Sargent Purchase).

PANAX L. Ginseng.

Panax quinquefolium L. Ginseng. Rich rocky woods, local.—Stark, Devil's Slide, *P.* 17481 (1919); Shelburne, *Deane* (1884, 1916).

Panax trifolium L. Dwarf Ginseng. Rich woods, local.—Randolph, *Mrs. G. F. Moore* (1905), *P.* 10357 (1907), 16418 (1917).

UMBELLIFERAE (PARSLEY FAMILY).

SANICULA [Tourn.] L. Sanicle; Black Snakeroot.

Sanicula marilandica L. Rich woods, frequent.—Pittsburg, Third Lake, *P.* 10177 = *M.* 3480 (1907); Clarksville, *P.* 17675 (1919); Columbia, *M.* 3842 (1907); Stratford, *P.* 17684 (1919); Lancaster, *Deane* (1896), *P.* 16926 (1917); Dalton, *P.* 16412 (1915); Whitefield, *P.* 14197 (1913); Gorham, *P.* 16425 (1915); Shelburne, *Deane* (1882).

Sanicula trifoliata Bicknell. Rich woods, rare.—Dalton, south of Cushman P. O., *P.* 16418 (1915).

HYDROCOTYLE [Tourn.] L. Water Pennywort.

Hydrocotyle americana L. Moist places, common.—Stewartstown, *P.* 10968 = *M.* 3692 (1907); Colebrook, *P.* 10363 (1907); (Columbia); (Stratford); (Northumberland); Milan, *P.* 14065 (1912); Lancaster, *P.* 17619 (1919); (Dalton); Whitefield, *Deane* (1897); Jefferson, *W. Boott* (1874); Randolph, *P.* 12671 (1910); Gorham, *M.* 4297 (1908); Shelburne, *Deane* (1882, 1913).

OSMORHIZA Raf. Sweet Cicely.

Osmorhiza Claytoni (Michx.) Clarke. Moist woods, frequent.—Clarksville, *P.* 11062 = *M.* 3720 (1907); (Stewartstown); Colebrook, *P.* 10423 = *M.* 3812 (1907); Stratford, *P.* 13570 (1912); (Stark); Milan, *P.* 13785 (1912); Berlin, *P.* 16102 (1914);

Lancaster, *P.* 14199 (1913), *S. N. F. Sanford* (1914); (Dalton); Whitefield, *Deane* (1896); Jefferson, *P.* 11090 (1907); Randolph, *Williams* (1896), *P.* 961 (1901), *M.* 1104 (1903), *P.* 4020 (1904), *M.* 3247 (1907); (Low & Burbank Grant); Gorham, *P.* 13663 (1912), 16005 (1914); Shelburne, *Deane* (1917).

Osmorhiza longistylis (Torr.) DC. Rich woods, rare.—Lancaster, *P.* 16387 (1915).

Osmorhiza divaricata Nutt. Rich woods, especially northward.—Pittsburg, near Third Lake, *P.* 10192 = *M.* 3492 (1907), Second Lake, *P.* 10187 = *M.* 3527 (1907); Colebrook Academy Grant, *P.* 14136 (1913); Atkinson & Gilmanton Academy Grant, Crystal Mt., *P.* 12668 (1910); Clarksville, *P.* 11061 = *M.* 3721 (1907); Stewartstown, Little Diamond Pond, *P.* 12632 (1910); (Millsfield); Stratford, Percy Peaks, *P.* 12744 (1910); Randolph, near Ice Gulch, *P.* 19074 (1922), Mossy Glen, *P.* 16499 (1915); Gorham, near Alpine Cascade, *P.* 16432 (1915); Bean Purchase, Carter Notch, *F. F. Forbes* (1900).

CICUTA L. Water Hemlock.

Cicuta bulbifera L. Swamps and margins of ponds, frequent.—(Pittsburg); (Clarksville); (Stewartstown); Stratford, *P.* 17655 (1919); Northumberland, *P.* 17245 (1918); Milan, Nay Pond, *P.* 13876 (1912); Dalton, Forest Lake, *P.* 17567 (1919); Whitefield, *P.* 11535 = *M.* 4423 (1908), *P.* 14557 (1913), 17794 (1919); (Carroll); Jefferson, Cherry Pond, *P.* 10688 (1907); Gorham, *P.* 10710 (1907); Shelburne, *Deane* (1914).

Cicuta maculata L. Spotted Cowbane. Moist meadows, rare.—Jefferson, *P.* 17495 (1919); Gorham, *P.* 19221 (1923).

CARUM [Rupp.] L. Caraway.

Carum Carvi L. Meadows and roadsides, common.—Pittsburg, First Lake, *P.* 10961 = *M.* 3655 (1907); (Clarksville); (Stewartstown); (Colebrook); (Columbia); (Stratford); (Stark); (Success); (Dalton); (Carroll); (Jefferson); Randolph, *Williams* (1895), *P.* 949, *M.* 208 (1902), *M.* 954, 1093 (1903); Gorham, *M.* 4236 (1908); Shelburne, *Deane* (1914).

SIUM [Tourn.] L. Water Parsnip.

Sium suave Walt. (*S. cicutaefolium* Schrank; *cf. Rhod.* 17 (1915), 131–132). Muddy banks, frequent.—(Pittsburg); Dartmouth College Grant, *P.* 16140 (1914); Cambridge, Lake Umbagog, *P.* 16553 (1915); Stratford, *P.* 17660 (1919); Dummer, *Williams* (1895); Northumberland, *P.* 17246 (1918); Dalton, *P.* 11604 = *M.* 4370 (1908); Gorham, *M.* 4061 (1907), *P.* 11439 (1908); Shelburne, *Deane* (1882, 1884).

CRYPTOTAENIA DC. Honewort.

Cryptotaenia canadensis (L.) DC. Shaded banks, local in the Connecticut valley.—Colebrook, *P.* 16314 (1914); Dalton, *P.* 16428 (1915).

ZIZIA Koch.

Zizia aurea (L.) Koch. Golden Alexanders. Meadows and thin woods, common.—Stewartstown. *P.* 10969 = *M.* 3669 (1907); (Columbia); Stratford, *P.* 13571 (1912); (Stark); (Northumberland); (Success); (Dalton); Whitefield, *Deane* (1896); (Jefferson); Randolph, *E. & C. E. Faxon* (1878), *J. R. Churchill* (1889), *Williams* (1897), *P.* 975 (1902), *M.* 950 (1903), *Mrs. G. F. Moore* (1905); (Gorham); Shelburne, *Deane* (1914, 1916); Bean Purchase, Wild River valley, *P.* 16019 (1914).

BUPLEURUM [Tourn.] L. Thorough-wax.

Bupleurum rotundifolium L. Rare garden weed.—Whitefield, *L. Döring* (1894).

PASTINACA L. Parsnip.

Pastinaca sativa L. Occasionally escaped from cultivation.—(Berlin); (Lancaster); Whitefield, *P.* 14194 (1913); Jefferson, *Williams* (1895); Randolph, *P.* 12359 (1909); Gorham, *M.* 4240 (1908); Shelburne, *Deane* (1882).

HERACLEUM L. Cow Parsnip.

Heracleum lanatum Michx. Wet meadows and roadsides; frequent at low levels and locally in alpine ravines.—Pittsburg, near Third Lake, *M.* 3505 (1907), near Second Lake, *M.* 3629 (1907), First Lake, *P.* 10822 = *M.* 3656 (1907); (Stewartstown);

Colebrook, *P.* 958 (1901); (Stratford); (Dummer); (Stark); (Northumberland); (Milan); (Success); (Berlin); (Lancaster); (Whitefield); (Carroll); Jefferson, *P.* 16540 (1917); Randolph, *Williams* (1896), *M.* 346 (1902), 956 (1903), *P.* 12688 (1910); Shelburne, *Deane* (1915, 1917); Pinkham Grant, *Deane* (1916); (Low & Burbank Grant); Thompson & Meserve Purchase, Great Gulf, *Williams* (1895); Sargent Purchase, Tuckerman Ravine, *M.* 289,290 (1902); Cutts Grant, Oakes Gulf, *Williams* (1895).

CONIOSELINUM Fisch. Hemlock Parsley.

Conioselinum chinense (L.) BSP. Cool moist woods, somewhat local.—Pittsburg, Second Lake, *P.* 10311 = *M.* 3426 (1907); Columbia, *P.* 17714 (1919); Stratford, *F.* & *P.* 16953 (1917); Lancaster, Mountorne, *P.* 14522 (1913); Dalton, *P.* 11540 = *M.* 4368 (1908); Shelburne, *P.* 11691 = *M.* 4176 (1908), *Deane* (1914), *P.* 16910 (1916).

ANGELICA L. Angelica.

Angelica atropurpurea L. Alluvial soil in the Connecticut valley, occasional; heads of alpine ravines, local.—Pittsburg, near village, *P.* 10865 = *M.* 3684 (1907); (Stewartstown); Northumberland, *F.* & *P.* 16584 (1917); Lancaster, *S. N. F. Sanford* (1914), Coös Junction, *P.* 12221 (1909), Grange, *P.* 16087 (1914); Sargent Purchase, Huntington Ravine, *P.* 13888 (1912), *F.* & *P.* 16902 (1917), Tuckerman Ravine, *E. Faxon* (1877), *J. R. Churchill* (1889), *Williams* (1895), *M.* 1487 (1903), *P.* 11092 (1907), *M.* 5089 (1913); Pinkham Grant, near Ellis River, *P.* 19072 (1922); Cutts Grant, Oakes Gulf, *Williams* (1896); alpine region, not definitely located, *Oakes* (no date).

CORNACEAE (DOGWOOD FAMILY).

CORNUS [Tourn.] L. Cornel; Dogwood.

Cornus canadensis L. Bunchberry. Woods and edges of fields and pastures, very common.—Pittsburg, near Second Lake, *M.* 3643 (1907), First Lake, *P.* 10295 = *M.* 3559 (1907); (Clarksville); Dartmouth College Grant, *P.* 16180 (1914); (Stewartstown); (Colebrook); (Columbia); (Millsfield); Stratford, *P.* 13587 (1912); (Stark); (Success); (Berlin); (Kilkenny); (Dalton); Whitefield, *Deane* (1897); Carroll, *Williams* (1895); (Jefferson); Ran-

dolph, *Williams* (1895), *M.* 976 (1903), *Mrs. G. F. Moore* (1905), *M.* 3375 (1907), *P.* 12157 (1909); (Gorham); Shelburne, *Deane* (1882, 1883, 1914); Low & Burbank Grant, Knife Edge, *P.* 12095 (1909); Thompson & Meserve Purchase, Mt. J. Q. Adams, *P.* 12707 (1910), Carriage Road, *Deane* (1882); Sargent Purchase, Tuckerman Ravine, *Williams* (1895), Boott Spur, *M.* 393 (1901); Cutts Grant, *Williams* (1893); (Pinkham Grant); Bean Purchase, *M.* 5066 (1913).

Cornus rugosa Lam. (*C. circinata* L'Hér.; *cf. Rhod.* 12 (1910), 122). Mostly on rocky talus slopes, somewhat local.—Northumberland, Cape Horn, *P.* 16455 (1917); Lancaster, Mt. Prospect, *P.* 17596 (1919), Martin Meadow Pond, *P.* 17812 (1920); Berlin, near Jasper Cave, *P.* 14507 (1913); (Gorham); Shelburne, *Deane* (1882, 1883, 1914); Hadley Grant, Mt. Hope, *P.* 16454 (1915).

Cornus stolonifera Michx. Red-osier Dogwood. Wet places, common.—Pittsburg, Second Lake, *P.* 10349=*M.* 3461 (1907); Dartmouth College Grant, *P.* 16161 (1914); Stewartstown, *P.* 13923 (1912); (Colebrook); (Columbia); Cambridge, Lake Umbagog, *P.* 18195 (1921); Stratford, *P.* 13522 (1912); (Dummer); (Stark); (Northumberland); (Milan); (Success); Berlin, *P.* 16464 (1917); Lancaster, *P.* 16422 (1915); Carroll, *P.* 14373 (1913), Twin Mt., *P.* 16652 (1916), Crawford's, *Williams* (1895); Gorham, *P.* 16106 (1914); Shelburne, *Deane* (1882, 1883, 1902, 1916), *Miss A. W. Christensen & Miss C. A. Gauthier* (1903).

Cornus alternifolia L. f. Woods, frequent.—(Stewartstown); (Millsfield); Stratford, *P.* 13517 (1912); (Dummer); (Stark); (Milan); Lancaster, *Deane* (1896); Dalton, *P.* 14588=*M.* 4895 (1913); Carroll, Crawford's, *Miss S. Minns* (no date); Randolph, *P.* 10566, *M.* 3299, 3337 (1907); (Gorham); Shelburne, *Deane* (1883); (Low & Burbank Grant); (Bean Purchase).

ERICACEAE (HEATH FAMILY).

CHIMAPHILA Pursh. Pipsissewa.

Chimaphila umbellata (L.) Nutt., var. **cisatlantica** Blake (*Rhod.* 19 (1917), 241–242). Dry woods, frequent.—Clarksville, *P.* 11038=*M.* 3767 (1907); Dartmouth College Grant, *P.* 16215 (1914); Cambridge, *Williams* (1906); Dummer, *P.* 18179 (1921);

Milan, *P.* 13838 (1912); Berlin, *P.* 17491 (1919); Randolph, *Williams* (1895), *P.* 12526 (1909); Gorham, *Williams* (1895), *P.* 12258 (1909); Shelburne, *Deane* (1882, 1883, 1916).

MONESES Salisb. One-flowered Pyrola.

Moneses uniflora (L.) Gray. Cold mossy woods, local.—Colebrook, *P.* 10370 = *M.* 3930 (1907), *P.* 13865 (1912), 17856 (1920); Shelburne, *Deane* (1881, 1882, 1883, 1916).

PYROLA [Tourn.] L. Shin Leaf; Pyrola.

Pyrola minor L. Cold woods, occasional.—Success, near Mahoosuc Notch, *P.* 16012 (1914); Bean Purchase, Wild River valley, *P.* 16015 (1914); Shelburne, Shelburne Moriah Mt., *W. H. Munter* (1918); Gorham, *E. Faxon* (1878); Low & Burbank Grant, Mt. Adams, *E. & C. E. Faxon* (1878), near Salmacis Fall, *P.* 16488 (1915); Thompson & Meserve Purchase, Base Station, *E. & C. E. Faxon* (1891); Sargent Purchase, Tuckerman Ravine, *Williams* (1895); Mt. Washington, not definitely located, *W. Boott* (1855), *W. F. Flint & J. H. Huntington* (1876); Carroll, *W. Boott* (1855), Beecher Cascades, *E. & C. E. Faxon* (1885).

Pyrola secunda L. Rich woods, frequent.—Pittsburg, First Lake, *Mrs. A. F. Stevens* (1895); Dartmouth College Grant, *P.* 16245 (1914); Millsfield, *P.* 18172 (1921); (Northumberland); Milan, *P.* 13767 (1912); (Success); Lancaster, *P.* 14228 (1913); Jefferson, *P.* 16871 (1916); Randolph, *Williams* (1893), *P.* 11516 (1908); Shelburne, *C. E. Faxon* (no date), *Deane* (1881, 1883); Martin Location, *P.* 11530 (1908); Thompson & Meserve Purchase, Base Station, *E. & C. E. Faxon* (1878); (Sargent Purchase).

Pyrola secunda L., var. **obtusata** Turcz. Cold mossy woods and cedar bogs, local.—Clarksville, *F. & P.* 16930 (1917); Colebrook, *P.* 10371 = *M.* 3931 (1907), *P.* 13940 (1912), *F. & P.* 16638 (1917), *P.* 17855 (1920); Columbia, *P.* 10493 (1907); Dalton, *P.* 17842 (1920); Jefferson, near Mud Pond, *P.* 16585 (1915); Randolph, Ice Gulch, *J. R. Churchill* (1889), *Williams* (1894, 1895), *P.* 1019 (1900).

Pyrola chlorantha Sw., var. **paucifolia** Fern. (*Rhod.* 22 (1920), 51–52). Woods, not infrequent southward.—Stark, Christine

Lake, *P.* 18090 (1920); Lancaster, Mt. Prospect, *P.* 14214 (1913), *S. N. F. Sanford* (1914); Dalton, *P.* 16094 (1914); Randolph, *Williams* (1893, 1896), *M.* 3190 (1906), 4038 (1907), *P.* 11417 (1908); Shelburne, *C. E. Faxon* (no date), *Deane* (1882, 1883); Low & Burbank Grant, Lowe's Path, *C. E. Lowe* (1880); (Thompson & Meserve Purchase); Sargent Purchase, Mt. Resolution, *P.* 14044 (1912); Bean Grant, Mt. Clinton, *T. O. Fuller* (1894); Hadley Grant, Mt. Hope, *P.* 16459 (1915).

Pyrola elliptica Nutt. Woods, common.—Dartmouth College Grant, *P.* 16247 (1914); Clarksville, *P.* 10428 = *M.* 3768 (1907), *F. & P.* 16960 (1917); (Stewartstown); Colebrook, *M.* 4016 (1907); (Columbia); Stratford, *P.* 13575 (1912); (Stark); (Dummer); Milan, *P.* 13751 (1912); (Berlin); (Lancaster); (Dalton); Whitefield, *Deane* (1896); Carroll, Crawford's, *Williams* (1895); (Jefferson); Randolph, *Williams* (1893, 1897), *P.* 10831, *M.* 4041 (1907); (Gorham); Shelburne, *Deane* (1882, 1883, 1910), *M.* 4873 (1911); Martin Location, *P.* 14346 (1913); (Bean Purchase).

Pyrola rotundifolia L., var. **americana** (Sweet) Fernald (*Rhod.* 22 (1920), 122). Sandy woods, etc., occasional.—Colebrook, *F. & P.* 16712 (1917); Northumberland, *P.* 12144 (1909); Milan, *P.* 13733 (1912); Martin Location, *P.* 14347 (1913); Shelburne, *Deane* (1881, 1882, 1883).

Pyrola asarifolia Michx. Sandy alluvial woods, local.—Stratford, *P.* 13576 (1912); Gorham, *P.* 11480 (1908); Shelburne, *Deane* (1883, 1921, 1922).

Pyrola asarifolia Michx., var. **incarnata** (Fisch.) Fern. Deep swampy woods, rare.—Dartmouth College Grant, *P.* 12601 (1910).

MONOTROPA L.

Monotropa uniflora L. Indian Pipe. Deep woods, common.—Dartmouth College Grant, *P.* 16275 (1914); (Millsfield); Dixville, *Williams* (1895); (Stark); Milan, *P.* 13956 (1912); Berlin, *P.* 16262 (1914); (Jefferson); Carroll, Crawford's, *Williams* (1895); Randolph, *Williams* (1895), *M.* 377 (1902), *P.* 11787 (1908); Shelburne, *Deane* (1883); (Bean Purchase); (Thompson & Meserve Purchase).

Monotropa Hypopitys L. Pinesap. Woods, occasional.—

Dartmouth College Grant, Diamond Peaks, *P.* 10582 (1907); Colebrook, *P.* 10751 = *M.* 3783 (1907); Lancaster, *S. N. F. Sanford* (1914); Mt. Prospect, *P.* 16921 (1917); Randolph, *Williams* (1894), *Mrs. G. F. Moore* (1901), *P.* 12265 (1909); Shelburne, *Deane* (1915, 1916); Low & Burbank Grant, Ravine of the Castles, *P.* 1016 (1900); Bean Grant, near Mt. Jackson, *P.* 12523 (1909); Carroll, Crawford's, *Miss S. Minns* (no date); Hadley Grant, Mt. Hope, *P.* 16472 (1915).

LEDUM [Rupp.] L. Labrador Tea.

Ledum groenlandicum Oeder. Cold bogs; peaty soil on mountain tops, common.—Pittsburg, Second Lake, *P.* 10348 = *M.* 3457 (1907), First Lake, *Mrs. A. F. Stevens* (1895); Dartmouth College Grant, *P.* 16211 (1904); Dixville, *Deane* (1915), *P.* 18197 (1921); (Stewartstown); Colebrook, *P.* 10897 = *M.* 4022 (1907); Errol, *P.* 12618 (1910); Stratford, *P.* 12746 (1910); Northumberland, *P.* 13642 (1912); Milan, *P.* 13780 (1912); Success, Mt. Success, *P.* 11127 = *M.* 4097 (1908); Berlin, Head Pond, *P.* 14504 (1913), York Pond, *P.* 17169 (1918); Lancaster, *Deane* (1896), *P.* 12240 (1909); Whitefield, *P.* 11581 (1908), Weed Pond, *P.* 14460 (1913); Jefferson, Mud Pond, *P.* 17349 (1918); Randolph, *M.* 3334 (1907), *P.* 11217, *M.* 4209, 4457 (1908), 4600 (1909); Gorham, Mascot Pond, *P.* 14030 (1912); Shelburne, *Deane* (1882, 1910, 1914), Gentian Pond, *Miss S. Sheppard & Miss A. P. Lowell* (1914), Shelburne Moriah Mt., *Miss A. W. Christensen & Miss C. A. Gauthier* (1917); Carroll, *P.* 14368 (1913); Low & Burbank Grant, Madison Hut, *P.* 10836 (1907); Thompson & Meserve Purchase, Mt. Madison, *M.* 1054 (1903), Parapet, *P.* 16485 (1915), Edmands Col, *M.* 3178 (1905), Mt. Clay, *E. & C. E. Faxon* (1889), Lowe's Bald Spot, *P.* 17502 (1919), Carriage Road, *Deane* (1882), *E. & C. E. Faxon* (1890); Sargent Purchase, Alpine Garden, *E. & C. E. Faxon* (1887), *B. L. Robinson* (1901), Tuckerman Ravine, *Miss H. L. Brown* (1885), *Miss S. Minns* (1888), *M.* 4560 (1913); Mt. Washington, not definitely located, *C. E. Faxon* (1872), *W. F. Flint & J. H. Huntington* (1876), *W. H. Manning* (1881), *F. F. Forbes* (1900); Cutts Grant, Crawford Path, *E. & C. E. Faxon* (1885), *Williams* (1893, 1895), *M.* 4539 (1909); Bean Grant, Mt. Clinton, *Williams* (1895); alpine region, not

definitely located, *Oakes* (no date), *J. A. Lowell* (1847); Hadley Grant, Mt. Crawford, *P.* 11752 (1908); Martin Location, *P.* 14295 (1913), 16419 (1917); Bean Purchase, *M.* 4048 (1913), North Baldface Mt., *P.* 16030 (1914).

RHODODENDRON L.

Rhododendron canadense (L.) BSP. Rhodora. Boggy pastures and peaty soil, common.—Pittsburg, Second Lake, *P.* 10245 = *M.* 3456 (1907); Dartmouth College Grant, *P.* 16212 (1914); Colebrook, *M.* 3798 (1907); Cambridge, Lake Umbagog, *P.* 16557 (1915), 18154 (1921); Stratford, *P.* 13518 (1912); (Northumberland); Stark, *P.* 14141 (1913); (Milan); Success, Mt. Success, *P.* 11207 = *M.* 4109 (1908); (Berlin); Lancaster, *S. N. F. Sanford* (1914); (Dalton); Whitefield, *Deane* (1896); Crawford Purchase, *P.* 11252 (1908); Jefferson, *P.* 17507 (1919); Randolph, *M.* 1049, *P.* 2528 (1903), 4028 (1904), 10235 = *M.* 3332 (1907); Shelburne, *Deane* (1882, 1884, 1909), *A. E. Philbrook* (1884), Gentian Pond, *Miss S. Sheppard & Miss A. P. Lowell* (1914); Bean Purchase, Imp Camp, *P.* 16760 (1917), West Royce Mt., *P.* 18134 (1921), North Baldface Mt., *P.* 16039 (1914); Martin Location, *P.* 14294 (1913), 16420 (1917); Thompson & Meserve Purchase, Six Husbands Trail, *P.* 12237 (1909); Cutts Grant, Oakes Gulf, *P.* 11215 (1908); Bean Grant, Mt. Clinton, *M.* 1082 (1903), Mt. Webster, *P.* 11270 (1908); Hadley Grant, Mt. Crawford, *P.* 11754 (1908).

Rhododendron lapponicum (L.) Wahlenb. Alpine Rhododendron. Alpine barrens, common.—Low & Burbank Grant, Knife Edge, *A. P. Chadbourne* (1884), *P.* 12736 (1910); Thompson & Meserve Purchase, Mt. Madison, *Williams* (1892), *P.* 1026 (1901), *M.* 3360 (1902), Parapet, *P.* 3149 (1903), Mt. Adams, *Miss E. F. Wiggins* (1880), Great Gulf, *P.* 11199 (1908), Cow Pasture, *Williams* (1898), Cape Horn, *Williams* (1896), Carriage Road, *Deane* (1884), *Williams* (1897); Sargent Purchase, near summit of Mt. Washington, *E. & C. E. Faxon* (1884), *E. D. Merrill* (1896), Alpine Garden, *E. & C. E. Faxon* (1879, 1887, 1890, 1895), *W. G. Farlow* (1894), *W. W. Eggleston* (1899, 1901), Lion Head, *E. & C. E. Faxon* (1890), *Williams* (1896), Boott Spur, *F. F. Forbes*, *M.* 173 (1901), near Lakes of the Clouds, *Wil-*

liams (1893), *Eggleston* (1903), *P.* 1027 (1899), Mt. Pleasant, *Miss S. Minns* (1885); Mt. Washington, not definitely located, *F. Boott* (1816), *E. & C. E. Faxon* (1872, 1878, 1888, 1894), *W. F. Flint & J. H. Huntington* (1876), *J. R. Churchill* (1895); Cutts Grant, Mt. Franklin, *E. & C. E. Faxon* (1881); alpine region, not definitely located, *Oakes* (no date), *A. Gray* (1842), *J. W. Chickering* (1864), *C. G. Pringle* (1879).

LOISELEURIA Desv. Alpine Azalea.

Loiseleuria procumbens (L.) Desv. Moist peaty soil in the alpine region, frequent.—Low & Burbank Grant, Nowell Peak, *M.* 3352 (1907); Thompson & Meserve Purchase, Mt. J. Q. Adams, *P.* 9894 (1906), Mt. Adams, *Miss F. C. Prince* (1892), Mt. Clay, *E. & C. E. Faxon, A. P. Chadbourne* (1884), *Williams* (1898), Great Gulf, *E. & C. E. Faxon* (1887, 1899); Sargent Purchase, summit of Mt. Washington, *H. H. Taylor* (1895), *Deane* (1897), Alpine Garden, *Williams* (1895, 1898), *W. W. Eggleston* (1899), Bigelow Lawn, *W. W. Eggleston* (1901), Lakes of the Clouds, *Williams* (1893); Mt. Washington, not definitely located, *F. Boott* (1816), *W. F. Flint & J. H. Huntington* (1876), *E. & C. E. Faxon* (1877, 1878), *W. G. Farlow* (1884); Cutts Grant, Mt. Monroe, *C. E. Faxon* (1885), *B. L. Robinson* (1901); alpine region, not definitely located, *Oakes* (no date), *J. A. Lowell* (1847), *C. G. Pringle* (no date).

KALMIA L. Laurel.

Kalmia angustifolia L. Sheep Laurel; Lambkill. Pastures, bogs, and mountain tops, common.—Pittsburg, Second Lake, *P.* 10243 = *M.* 3463 (1907); Stewartstown, *P.* 10974 = *M.* 3693 (1907); Colebrook, *P.* 10431 = *M.* 3800 (1907); (Millsfield); Stratford, Percy Peaks, *P.* 12740 (1910); Northumberland, *P.* 13454, 13547 (1912); (Stark); (Dummer); (Milan); Success, *M.* 4312 (1908), Mt. Success, *M.* 4719 (1908); (Berlin); (Dalton); Whitefield, *P.* 16684 (1916); (Jefferson); Randolph, Pond of Safety, *P.* 4696 (1904); (Gorham); Shelburne, *Deane* (1882, 1884, 1915, 1916), Gentian Pond, *Miss Sheppard & Miss Lowell* (1914), Shelburne Moriah Mt., *Miss A. W. Christensen & Miss C. A. Gauthier* (1917); Martin Location, *P.* 14308 (1913); Bean Purchase, Imp Camp, *P.* 16764 (1917), West Royce Mt., *P.* 18132

(1921), North Baldface Mt., *P.* 16040 (1914); Thompson & Meserve Purchase, Lowe's Bald Spot, *P.* 17501 (1919); Bean Grant, Mt. Jackson, *P.* 12321 (1909).

Kalmia polifolia Wang. Pale Laurel. Cold bogs and peaty soil on mountains, frequent.—Pittsburg, Second Lake, *P.* 10320 (1907); Dartmouth College Grant, *P.* 16210 (1914); Stewartstown, Buck Pond, *F. & P.* 16679 (1917); Northumberland, Groveton, *P.* 17147 (1918), lower Jonathan Pond, *P.* 13548 (1912); Milan, *P.* 13720 (1912); Success, Mt. Success, *P.* 11128 = *M.* 4099 (1908); Berlin, Head Pond, *P.* 14502 (1913); Lancaster, *P.* 12271 (1909); Whitefield, Weed Pond, *P.* 14461 (1913); (Jefferson); Randolph, Pond of Safety, *P.* 10236 = *M.* 3331 (1907), *P.* 16442 (1917); Shelburne, *Deane* (1882, 1884, 1904), *A. E. Philbrook* (1883), *M.* 4131 (1908); Thompson & Meserve Purchase, Mt. J. Q. Adams, *P.* 9892 (1906), Cape Horn, *Williams* (1897, 1898), *B. L. Robinson* (1901), Carriage Road, *Deane* (1882); Sargent Purchase, Tuckerman Ravine, *J. Schrenk* (no date), *M.* 260 (1902), Lakes of the Clouds, *E. & C. E. Faxon* (1877), Ammonoosuc Ravine, *P.* 16771 (1916); Mt. Washington, not definitely located, *F. Boott* (1816), *W. F. Flint & J. H. Huntington* (1876), *J. R. Churchill* (1890); Bean Grant, Mt. Clinton, *Williams* (1895), *M.* 108 (1903); Mt. Jackson, *P.* 12301 (1909); alpine region, not definitely located, *Oakes* (no date).

PHYLLODOCE Salisb.

Phyllodoce coerulea (L.) Bab. Moist slopes in the alpine region, frequent.—Low & Burbank Grant, near Nowell Peak, *M.* 3364 (1907); Thompson & Meserve Purchase, Mt. Madison, *P.* 987 (1901), Mt. J. Q. Adams, *P.* 10875 (1907), Mt. Jefferson, *P.* 12234 (1909), Mt. Clay, *A. P. Chadbourne* (1884), *Williams* (1898), *M.* 3193 (1906), Great Gulf, *P.* 11200 (1908); Sargent Purchase, summit of Mt. Washington, *A. P. Garber* (1874), *Deane* (1897), Alpine Garden, *E. & C. E. Faxon* (1888, 1889, 1890), *J. R. Churchill, Williams* (1895), *W. W. Eggleston* (1899), *B. L. Robinson* (1901), Bigelow Lawn, *W. W. Eggleston* (1901), above Tuckerman Ravine, *M.* 4559 (1909), Lakes of the Clouds, *E. & C. E. Faxon* (1884, 1887, 1895), *Williams* (1893); Mt. Washington, not definitely located, *F. Boott* (1816), *W. F.*

Flint & J. H. Huntington (1876), *A. Fairbanks* (1883), *W. G. Farlow* (1884), *J. R. Churchill* (1890), *E. D. Merrill* (1896); Cutts Grant, slopes of Mt. Monroe, *E. & C. E. Faxon* (1885, 1893), *J. R. Churchill* (1885), Oakes Gulf, *Williams* (1898), *B. L. Robinson* (1901), *P.* 11229 (1908); alpine region, not definitely located, *Oakes* (no date), *A. Gray* (1842), *J. A. Lowell* (1847), *J. W. Chickering* (1862), *C. G. Pringle* (1877).

CASSIOPE D.Don.

Cassiope hypnoides (L.) D.Don. Moist heads of alpine ravines, etc., somewhat local.—Low & Burbank Grant, *P.* 12100 (1909), King Ravine, *F. & P.* 16846 (1917); Thompson & Meserve Purchase, Mt. Adams, *P.* 3245 (1902), Mt. Clay, *A. P. Chadbourne* (1884), *Williams* (1897, 1898), Great Gulf, *E. & C. E. Faxon* (1884, 1887), *P.* 11211 (1908); Sargent Purchase, cone of Mt. Washington, *G. Hunt* (1840), *E. D. Merrill* (1896), *Deane* (1897), *M.* 279 (1902), Alpine Garden, *E. & C. E. Faxon* (1889), *Williams* (1895), *W. W. Eggleston* (1899, 1901), *B. L. Robinson* (1901), *P.* 10549 (1907), Tuckerman Ravine, *E. & C. E. Faxon* (1885), *P.* 993 (1901), Boott Spur, *F. F. Forbes* (1901), Lakes of the Clouds, *W. Boott* (1855), *Williams* (1893); Cutts Grant, Oakes Gulf, *Williams* (1898); Mt. Washington, not definitely located, *W. F. Flint & J. H. Huntington* (1876), *W. G. Farlow* (1884), *E. Faxon* (1885), *J. R. Churchill* (1895); alpine region, not definitely located, *Oakes* (no date), *B. D. Greene* (no date), *J. Bigelow* (1841), *A. Gray* (1842), *H. Mann* (1862), *L. F. Ward* (1875).

ANDROMEDA L.

Andromeda glaucophylla Link. Peat bogs, frequent.—Dartmouth College Grant, *P.* 16209 (1914); Stewartstown, Buck Pond, *F. & P.* 16677 (1917); Northumberland, Groveton, *P.* 17153 (1918), lower Jonathan Pond, *P.* 13546 (1912); Milan, Mud Pond, *P.* 13848 (1912); Berlin, Head Pond, *P.* 14505 (1913); Lancaster, *Deane* (1896), near Mountorne station, *P.* 12349 (1909); Whitefield, Weed Pond, *P.* 14414 (1913); Jefferson, Cherry Pond, *P.* 10667 (1907), Little Cherry Pond, *P.* 14570 (1913); Shelburne, Wheeler Bog, *Deane* (1881, 1882), *A. E. Philbrook* (1883), *P.* 11315 (1908).

CHAMAEDAPHNE Moench. Leather Leaf; Cassandra.

Chamaedaphne calyculata (L.) Moench. Boggy shores, common; mountain tops, occasional.—Pittsburg, Second Lake, *P.* 10246=*M.* 3459 (1907); (Clarksville); (Stewartstown); Cambridge, Lake Umbagog, *P.* 16559 (1915); (Stark); Northumberland, *P.* 13455 (1912); Milan, Mud Pond, *P.* 13758 (1912); Success, Mt. Success, *P.* 11166 (1908); Berlin, York Pond, *P.* 17170 (1918); (Lancaster); (Dalton); Carroll, Crawford's, *P.* 16653 (1916); (Jefferson); Randolph, Pond of Safety, *P.* 991 (1902), 16438 (1917); (Gorham); Shelburne, *M.* 4128 (1908); Wheeler Bog, *Deane* (1881, 1882, 1883), Gentian Pond, *Miss Sheppard & Miss Lowell* (1914), Shelburne Moriah Mt., *Miss A. W. Christensen & Miss C. A. Gauthier* (1917); Bean Purchase, Imp Camp, *P.* 16767 (1917); Hadley Grant, Mt. Crawford, *P.* 11756 (1908).

EPIGAEA L. Trailing Arbutus; Mayflower.

Epigaea repens L. Rocky or sandy alluvial woods, etc., frequent southward.—Errol, *P.* 12616 (1910); Stratford, *P.* 13508 (1912); Stark, near Pike Pond, *P.* 14139 (1913); Northumberland, near lower Jonathan Pond, *P.* 13562 (1912); Milan, *P.* 13836 (1912); Berlin, Mt. Forist, *P.* 4700 (1904); Whitefield, *P.* 14571=*M.* 5029 (1913); Carroll, Crawford's, *Williams* (1895); Jefferson, *P.* 12932 (1910); Randolph, *M.* 1130 (1903); Shelburne, *Deane* (1882), *P.* 10802 (1907), 11168 =*M.* 4112 (1908), *Deane* (1909); Bean Purchase, Wild River valley, *P.* 16022 (1914), 17934 (1920).

GAULTHERIA [Kalm] L. Wintergreen; Checkerberry.

Gaultheria procumbens L. Woods and clearings, common southward.—(Stark); Milan, *P.* 13856 (1912); (Berlin); (Dalton); Whitefield, *Deane* (1897), *P.* 11572=*M.* 4390 (1908); Jefferson, *P.* 12805 (1910); Randolph, *Williams* (1895, 1896), *P.* 4051½, 4151 (1904), *M.* 4462 (1908); Gorham, *P.* 12269 (1909); Shelburne, *Deane* (1882, 1883), *M.* 4333 (1908); (Bean Purchase).

ARCTOSTAPHYLOS Adans. Bearberry.

Arctostaphylos Uva-ursi (L.) Spreng., var. **coactilis** Fernald & Macbride (*Rhod.* 16 (1914), 212–213). Sunny slopes and

ledges, rare.—Berlin, east of Head Pond, *P.* 19077 (1922); Hadley Grant, Hart Ledge, *P.* 16633 (1915).

Arctostaphylos alpina (L.) Spreng. Alpine Bearberry. Alpine barrens, local.—Thompson & Meserve Purchase, Cape Horn, *Williams* (1893, 1896), Carriage Road, *E. Faxon* (1880), *E. & C. E. Faxon* (1893); Sargent Purchase, Alpine Garden, *Williams* (1895, 1896, 1898), *W. W. Eggleston* (1899), *B. L. Robinson* (1901), *P.* 10559 (1907), Lion's Head, *E. & C. E. Faxon* (1890), Boott Spur, *E. & C. E. Faxon* (1878, 1879), *W. G. Farlow* (1884), *F. F. Forbes* (1901); Mt. Washington, not definitely located, *F. Boott* (1816), *W. F. Flint & J. H. Huntington* (1876), *C. B. Graves* (1891); Bean Grant, Mt. Clinton, *A. Gray* (1842), *E. & C. E. Faxon* (1877, 1881, 1883), *Williams* (1895), *W. W. Eggleston* (1901); alpine region, not definitely located, *Oakes* (no date).

CALLUNA Salisb. Heather; Ling.

Calluna vulgaris (L.) Hull. Very rarely adventive.—Randolph, roadside, *Mrs. C. H. French* (1922), *P.* 19102 (1922), persistent in 1923.

CHIOGENES Salisb. Creeping Snowberry.

Chiogenes hispidula (L.) T. & G. Cool, mossy woods, common.—Pittsburg, Second Lake, *P.* 10274=*M.* 3441 (1907); (Clarksville); Dartmouth College Grant, *P.* 16222 (1914); (Millsfield); (Dixville); (Colebrook); (Stark); Success, Mt. Success, *M.* 4092 (1908); Lancaster, *Deane* (1896); (Jefferson); Carroll, *Williams* (1893); Randolph, *Williams* (1893), *P.* 12229 (1909); (Gorham); Shelburne, *Deane* (1882, 1883), *C. F. Batchelder* (1883), *Deane, Miss L. M. Brown* (1914); Martin Location, *P.* 14394 (1913); Green Grant, *W. Boott* (1855); (Pinkham Grant); Bean Purchase, Carter Notch, *M.* 5062 (1913); Low & Burbank Grant, 12352 (1909); Thompson & Meserve Purchase, Cape Horn, *Williams, B. L. Robinson* (1901); Sargent Purchase, Hermit Lake, *F. F. Forbes* (1901).

GAYLUSSACIA HBK. Huckleberry.

Gaylussacia baccata (Wang.) K. Koch. Moist open soil, especially near ponds, local.—Milan, Nay Pond, *P.* 19174 (1923);

Berlin, York Pond, *P.* 17189 (1918), Head Pond, *P.* 19068 (1922); Dalton, Forest Lake, *P.* 17572 (1919); Jefferson, Mud Pond, *P.* 17348 (1918); Bean Purchase, Wild River valley, near height of land toward North Chatham, *P.* 17933 (1920); Shelburne, open woods, *Deane* (1922).

VACCINIUM L. Blueberry; Cranberry.

Vaccinium pennsylvanicum Lam. Pastures, rocky ledges, etc., common, especially southward.—(Stark); Success, Mt. Success, *M.* 4095 (1908); Berlin, *P.* 17825 (1920); Lancaster, *P.* 12108 (1909), 14534 (1913); Whitefield, *Deane* (1896, 1897 with entire leaves); (Jefferson); Randolph, *P.* 1237 (1909); (Gorham); Shelburne, *C. F. Batchelder* (1883 with pubescent stem and entire leaves), *Deane* (1904, 1914); Bean Purchase, *M.* 5057 (1913), North Baldface Mt., *P.* 16048 (1914); Thompson & Meserve Purchase, Lowe's Bald Spot, *P.* 17496 (1919), Carriage Road, *F. & P.* 16871 (1917).

Vaccinium pennsylvanicum Lam., var. **angustifolium** (Ait.) Gray. Mountain tops, common.—Success, Mt. Success, *P.* 11206 = *M.* 4125 (1908); Bean Purchase, North Baldface Mt., *P.* 16034 (1914); Low & Burbank Grant, Nowell Ridge, *P.* 1048 (1901), *M.* 3349 (1907); Thompson & Meserve Purchase, Parapet, *P.* 10228 (1907), Mt. J. Q. Adams, *P.* 10874 (1907), Mt. Clay, *W. Boott* (1855), Carriage Road, *Deane* (1884), Cape Horn, *Williams* (1896); Sargent Purchase, Alpine Garden, *E. & C. E. Faxon* (1889, 1895), *J. R. Churchill* (1895), Lakes of the Clouds, *W. W. Eggleston* (1901); Mt. Washington, not definitely located, *J. A. Allen* (1878), *W. G. Farlow* (1884), *E. & C. E. Faxon* (1885), *M.* 297 (1902), *W. W. Eggleston* (1903); Cutts Grant, Oakes Gulf, *Williams* (1895); Bean Grant, Mt. Clinton, *M.* 1072 (1903), Mt. Jackson, *P.* 12298 (1919); alpine region, not definitely located, *Oakes* (no date), *C. J. Sprague* (no date), *Miss S. Minns* (no date).

Vaccinium pennsylvanicum Lam., var. **nigrum** Wood. With the species, etc., frequent.—Errol, *F. & P.* 17071 (1917); (Stratford, Percy Peaks); Northumberland, Cape Horn, *P.* 16449 (1917); Berlin, Mt. Forist, *P.* 16100 (1914), 17482 (1919); Kilkenny, Green Ledge, *P.* 13961 (1912); Dalton, *P.* 17512 (1919);

Jefferson, *P.* 16822 (1916), without bloom, and the leaves not bluish; Randolph, Appalachia, *P.* 10681 (1907); Gorham, *P.* 12217 (1919); Shelburne, *Deane* (1883, 1884, 1914), *A. E. Philbrook* (1883).

Vaccinium canadense Kalm. Woods, fields, etc., very common.—Pittsburg, Second Lake, *P.* 10244 = *M.* 3460 (1907); (Clarksville); Dartmouth College Grant, *P.* 16235 (1914); (Stewartstown); (Colebrook); (Errol); Stratford, *P.* 13485 (1912); (Northumberland); (Stark); Success, *M.* 4094 (1908); (Berlin); (Kilkenny); (Lancaster); (Dalton); Whitefield, *Deane* (1897); Jefferson, *P.* 16530 (1917); Randolph, *Williams* (1897), *P.* 10680, 10698, *M.* 3330 (1907); (Gorham); Shelburne, *Deane* (1883, 1904, 1914); (Bean Purchase); (Low & Burbank Grant); Thompson & Meserve Purchase, Lowe's Bald Spot, *P.* 17579 (1919), Carriage Road, *F. & P.* 16856 (1917); Sargent Purchase, Tuckerman Ravine, *E. & C. E. Faxon* (1885), *M.* 1065 (1903); Mt. Washington, not definitely located, *W. F. Flint & J. H. Huntington* (1876), *A. Fairbanks* (1883); Cutts Grant, Southern Peaks, *M.* 1087 (1903); alpine region, not definitely located, *Oakes* (no date).

Vaccinium canadense Kalm, f. **chiococcum** Deane. Rare.—Gorham, Pine Mt.. *P.* 17723 (1919). For its occurrence in Shelburne see *Rhod.* 3 (1901), 266.

Vaccinium vacillans Kalm. Rare.—Shelburne, *Deane* (1883).

Vaccinium corymbosum L. High Blueberry. Swamps, rare.—Whitefield, *Deane* (1896, 1897); Dalton, Forest Lake, *P.* 17577 (1919).

Vaccinium uliginosum L., var. **alpinum** Bigel. (*cf. Rhod.* 25 (1923), 23–25). Bog Bilberry. Very common on alpine barrens and occasionally found at lower levels.—Success, Mt. Success, *P.* 1126 = *M.* 4017 (1908); Berlin, rocks by Androscoggin River, *Deane* (1883); Randolph, Ice Gulch, *P.* 11497 (1908), 16654 (1917); Low & Burbank Grant, Jefferson Notch, *P.* 11235 (1908), King Ravine, *P.* 12094 (1909); Thompson & Meserve Purchase, Mt. Madison, *M.* 226 (1902), Northern Peaks, *A. P. Chadbourne* (1884), *M.* 1057 (1903), Carriage Road, *Deane* (1882), *E. & C. E. Faxon* (1888), *Miss C. A. Gauthier* (1915); Sargent

Purchase, Tuckerman Ravine path, *Williams* (1895), Lion's Head, *E. & C. E. Faxon* (1887); Cutts Grant, base of Mt. Monroe, *E. Faxon* (1885), *Williams* (1895); Mt. Washington, not definitely located, *W. F. Flint & J. H. Huntington* (1876), *Deane* (1884), *Williams* (1893); Bean Grant, Mt. Clinton, *Williams* (1895), Mt. Webster, *P.* 11716 (1908); Martin Location, *P.* 17205 (1918); Bean Purchase, North Baldface Mt., *P.* 16032 (1914), West Royce Mt., *P.* 18136 (1921); Carroll, railroad cut north of Crawford's, *P.* 16665 (1916).

Vaccinium caespitosum Michx. Dwarf Bilberry. Common in the alpine region; occasional at lower levels in sandy or gravelly alluvium.—Atkinson & Gilmanton Academy Grant, *P.* 12636 (1910); Dartmouth College Grant, Diamond River, *P.* 12639 (1910), 16154 (1914); Randolph, *Williams* (1896), *P.* 12522 (1909), 16478 (1917); Gorham, *P.* 12326 (1909), 14243 (1913); Martin Location, *P.* 13666 (1912), 17206 (1918); Carroll, Bretton Woods, *P.* 16659 (1916); Low & Burbank Grant, *P.* 12096 (1909); Thompson & Meserve Purchase, Mt. J. Q. Adams, *P.* 10847 (1907), Six Husbands Trail, *P.* 12235 (1909), Mt. Clay, *A. P. Chadbourne* (1884), Cape Horn, *Williams* (1898), Carriage Road, *E. & C. E. Faxon* (1888); Sargent Purchase, summit of Mt. Washington. *F. F. Forbes* (1902), Alpine Garden, *E. & C. E. Faxon* (1890), *Williams* (1893), Tuckerman Ravine, *W. W. Eggleston* (1899), *P.* 11490 (1908), 12045 = *M.* 4562 (1909), Lakes of the Clouds. *J. A. Allen* (1880); Mt. Washington, not definitely located, *W. Boott* (1855), *W. G. Farlow* (1884), *E. Faxon* (1890); Cutts Grant, Mt. Monroe, *E. & C. E. Faxon* (1885), *Williams* (1895); alpine region, not definitely located, *Oakes* (no date), *H. Mann* (1862), *G. L. Goodale* (no date), *W. H. Manning* (1881).

Vaccinium Vitis-Idaea L., var. **minus** Lodd. Mountain Cranberry. Common on gravelly or mossy mountain tops; occasional in dry or sandy soil at lower levels.—Dixville Notch, *E. & C. E. Faxon* (1887), *P.* 18149 (1921); Stratford, Percy Peaks, *P.* 12747 (1910); Stark, Christine Lake, *P.* 14125 (1913); Success, Mt. Success, *P.* 11208 = *M.* 4098 (1908); Berlin, *P.* 17142 (1918); Lancaster, *Deane* (1896), Martin Meadow Pond, *P.* 17588 (1919); Randolph, *Williams* (1897), Appalachia, *P.* 11699 (1908), Ice Gulch, *M.* 4601 (1909); Gorham, river bank, *P.* 12517 (1909), 16002

(1914); Shelburne, *Deane* (1882, 1883), Crow's Nest, *Deane* (1914), Shelburne Moriah Mt., *Miss A. W. Christensen & Miss C. A. Gauthier* (1917); Bean Purchase, *M.* 5061 (1913), North Baldface Mt., *P.* 16035 (1914); Martin Location, *P.* 14395 (1913); Crawford Purchase, Falls of the Ammonoosuc, *P.* 11416 (1908); Low & Burbank Grant, Nowell Ridge, *P.* 12305 (1909); Thompson & Meserve Purchase, Mt. Madison, *J. R. Churchill* (1889), *M.* 227 (1902), Mt. Jefferson, *E. & C. E. Faxon* (1885), Jefferson Ravine, *M.* 366 (1902), Mt. Clay, *E. & C. E. Faxon* (1889), Carriage Road, *Deane* (1882), *E. & C. E. Faxon* (1885), *Williams* (1898), *B. L. Robinson* (1901); Sargent Purchase, Alpine Garden, *E. & C. E. Faxon* (1890), Tuckerman Ravine, *E. D. Merrill* (1896), Boott Spur, *E. & C. E. Faxon* (1887), Lakes of the Clouds, *Williams* (1893); Mt. Washington not definitely located, *F. Boott* (1816), *C. E. Faxon* (1872), *W. F. Flint & J. H. Huntington* (1876), *J. A. Allen* (1878), *W. H. Manning* (1881), *A. Fairbanks* (1883), *J. R. Churchill* (1895); Cutts Grant, Oakes Gulf, *J. R. Churchill* (1895), Mt. Monroe, *E. & C. E. Faxon* (1885); Bean Grant, Mt. Clinton, *H. St. John* (1909); Hadley Grant, Mt. Crawford, *P.* 11786 (1908); alpine region, not definitely located, *Oakes* (no date), *J. A. Lowell* (1846, 1847), *H. Mann* (1862), *C. G. Pringle* (1877).

Vaccinium Oxycoccus L. (including var. *ovalifolium* Michx.). Small Cranberry. Bogs, frequent.—Pittsburg, Second Lake, *P.* 10272 = *M.* 3433 (1907); Stewartstown, Buck Pond, *F. & P.* 16745 (1917); Colebrook, *P.* 10907 = *M.* 4020 (1907); Northumberland, *Oakes* (no date), lower Jonathan Pond, *P.* 13451 (1912); Milan, Mud Pond, *P.* 13831 (1912); Success, Mt. Success, *P.* 11303 = *M.* 4101 (1908); Lancaster, Baker Pond, *P.* 17257 (1918); Dalton, *P.* 12362 (1909); Jefferson, *P.* 11511 (1908); Shelburne, *Deane* (1882, 1883, 1914), Shelburne Moriah Mt., *Miss A. W. Christensen & Miss C. A. Gauthier* (1917); Bean Purchase, Mt. Lethe, *P.* 10523 (1907), North Baldface Mt., *P.* 16036 (1914); Thompson & Meserve Purchase, *P.* 12236 (1909); Bean Grant, *P.* 12299 (1909).

Vaccinium macrocarpon Ait. American Cranberry. Bogs, occasional.—Stewartstown, Buck Pond, *F. & P.* 16771 (1917); Cambridge, Lake Umbagog, *P.* 16556 (1915); Lancaster, *P.* 12382

(1909); Whitefield, *Deane* (1896), Weed Pond, *P.* 14417 (1913); Jefferson, *P.* 11512 (1908), Cherry Pond, *P.* 11513 (1908); Gorham, *P.* 12209 (1909); Shelburne, *Deane* (1883, 1913).

DIAPENSIACEAE (DIAPENSIA FAMILY).

DIAPENSIA L.

Diapensia lapponica L. Common on alpine barrens and locally abundant at Dixville Notch.—Dixville, abundant on cliffs in Notch, *P.* 18198 (1921); Low & Burbank Grant, King Ravine, *P.* 1036 (1901); Spur Trail, *M.* 3350 (1907); Thompson & Meserve Purchase, Mt. Madison, *A. P. Chadbourne* (1884), *P.* 10231, *M.* 3358 (1907), Great Gulf, *Williams* (1895), *P.* 11335 (1908), Cow Pasture, *Williams* (1893, 1898), *J. R. Churchill* (1895), Cape Horn, *Williams* (1898); Sargent Purchase, near summit of Mt. Washington, *W. Boott* (1853), *Deane* (1882, 1884), *A. E. Philbrook* (1882), *E. D. Merrill* (1896), *V. Bailey* (1910), Alpine Garden, *E. & C. E. Faxon* (1890), *E. F. Williams* (1897, 1898), Tuckerman Ravine, *H. Mann* (1862), Lakes of the Clouds, *E. & C. E. Faxon* (1888), Crawford Path, *Williams* (1895); Mt. Washington, not definitely located, *F. Boott* (1816), *E. & C. E. Faxon* (1876), *Miss F. C. Prince* (1890), *J. M. Greenman* (1898); Cutts Grant, Mt. Monroe, *M.* 1068 (1903), Mt. Pleasant, *Miss S. Minns* (1885); Bean Grant, *P.* 12297 (1909), Mt. Clinton, *E. & C. E. Faxon* (1881), Mt. Webster, *P.* 11783 (1908); alpine region, not definitely located, *Oakes* (no date), *A. Gray* (1842), *C. J. Sprague* (no date), *J. W. Chickering* (1862, 1875), *Rudkin* (1882).

PRIMULACEAE (PRIMROSE FAMILY).

LYSIMACHIA [Tourn.] L. Loosestrife.

Lysimachia terrestris (L.) BSP. Low ground, common.—Pittsburg, First Lake, *Mrs. A. F. Stevens* (1895); (Clarksville); Dartmouth College Grant, *P.* 16231 (1914); (Stewartstown); Colebrook, *P.* 10900, *M.* 4017 (1907); Columbia, *P.* 10467, *M.* 3914 (1907); (Cambridge); (Stratford); (Northumberland); Dummer, *Williams* (1895); (Milan); (Success); Berlin, *P.* 9898 =*M.* 3212 (1906); (Dalton); Carroll, Crawford's, *Williams* (1895); (Jefferson); Randolph, *P.* 1070 (1902), 4027 (1904);

(Gorham); Martin Location, *P.* 14307 (1913); Shelburne, *Deane* (1882, 1883, 1902).

Lysimachia Nummularia L. Moneywort. Occasionally escaped.—Lancaster, *P.* 16728 (1916); Shelburne, *Deane* (1919).

STEIRONEMA Raf.

Steironema ciliatum (L.) Raf. Alluvial soil, frequent.—Pittsburg, near Canaan line, *P.* 11053 = *M.* 3751 (1907); (Stewartstown); Colebrook, *P.* 10484 = *M.* 3912 (1907); (Columbia); Errol, *Williams* (1895); Odell, near Pond Stream, *P.* 16303 (1914); Stratford, *P.* 17651 (1919); Northumberland, *P.* 12137 (1909), 17250 (1918); Milan, *P.* 13874 (1912); Lancaster, *P.* 12137 (1909); Randolph, *P.* 12219 (1909); Martin Location, *P.* 14269 (1913); Shelburne, *Deane* (1881, 1882, 1883, 1914).

Steironema lanceolatum (Walt.) Gray. Rare.—Randolph, *P.* 16755 (1916).

TRIENTALIS [Rupp.] L. Star Flower.

Trientalis borealis Raf. (*T. americana* (Pers.) Pursh; *cf. Rhod.* II (1909), 236). Woods, common.—Pittsburg, First Lake, *M.* 3617 (1907); Dartmouth College Grant, *P.* 16249 (1914); Colebrook, *P.* 10366 = *M.* 3932 (1907); (Millsfield); Stratford, *P.* 13588 (1912); (Success); (Lancaster); (Dalton); Whitefield, *Deane* (1895, 1896); (Carroll); Randolph, *Mrs. G. F. Moore* (1905), *M.* 3258 (1907), *P.* 11176 (1908); Shelburne, *Deane* (1883, 1915, 1916); Low & Burbank Grant, Lowe's Path, *P.* 1075 (1900), Randolph Path, *P.* 11196 (1908); Thompson & Meserve Purchase, Mt. J. Q. Adams, *P.* 12706 (1910), Carriage Road, *Deane* (1882); Sargent Purchase, Alpine Garden, *Williams* (1895), *B. L. Robinson* (1901); (Pinkham Grant); (Bean Purchase).

OLEACEAE (OLIVE FAMILY).

FRAXINUS [Tourn.] L. Ash.

Fraxinus americana L. White Ash. Woods and roadsides, frequent, especially southward. Chittenden (*Forest conditions in northern N. H.* (1905), 60) reports this tree at 2300 ft. elevation on Mt. Hayes in Gorham.—(Milan); (Northumberland); (Lancaster); Whitefield, *Deane* (1895); (Carroll); Jefferson, *Williams*

(1895); Randolph, *Williams* (1897), *M.* 1427 (1903), *P.* 4051 (1904), 10854 (1907), 11144 (1908); (Gorham); Shelburne, *Deane* (1882).

Fraxinus nigra Marsh. Black Ash. Swamps, common.—(Pittsburg); Dartmouth College Grant, *P.* 16205 (1914); (Stewartstown); (Colebrook); (Columbia); (Stratford); (Stark); (Milan); (Success); (Berlin); Dalton, *P.* 17381 (1919); Whitefield, *Deane* (1895), *P.* 16687 (1916); (Carroll); (Jefferson); Randolph, *Williams* (1896), *P.* 10526 (1907); (Gorham); Shelburne, *Deane* (1882, 1883).

SYRINGA L. Lilac.

Syringa vulgaris L. Long persistent and spreading around old house sites.—Randolph, *M.* 3313, 4045, *P.* 10792 (1907); Martin Location, *P.* 10531 (1907); Shelburne, *Deane* (1918).

GENTIANACEAE (GENTIAN FAMILY).

GENTIANA [Tourn.] L. Gentian.

Gentiana linearis Froel. Bogs and wet meadows, sporadic; rarely abundant.—Cambridge, Lake Umbagog, *P.* 10621 (1907); Errol, *P.* 16533 (1915); Milan, *P.* 13964 (1912), 17940 (1920); Success, *P.* 16536 (1915); Shelburne, *Deane* (1883, 1885, 1915), Gentian Pond, *A. C. Sprague, Miss S. Sheppard & Miss A. P. Lowell* (1914); Lancaster, Coös Junction, *P.* 12825 (1910).

HALENIA Borkh. Spurred Gentian.

Halenia deflexa (Sm.) Griseb. Very local.—Colebrook, Lombard Hill, *F. & P.* 16624, 16946 (1917).

MENYANTHES [Tourn.] L. Buckbean.

Menyanthes trifoliata L. Edges of ponds and wet meadows, not common.—Stewartstown, *P.* 10762 = *M.* 3970 (1907), Buck Pond, *F. & P.* 16605 (1917); Stark, Christine Lake, *P.* 14148 (1913); Lancaster, north of fairground, *P.* 17146 (1918); Shelburne, Wheeler Bog, *Deane* (1882, 1904), *P.* 11328 = *M.* 4133 (1908).

NYMPHOIDES [Tourn.] Hill. Floating Heart.

Nymphoides lacunosum (Vent.) Kuntze. Ponds, infrequent.—Randolph, Pond of Safety, *M.* 1137 (1903), *P.* 9916 (1906).

APOCYNACEAE (DOGBANE FAMILY).

APOCYNUM [Tourn.] L. DOGBANE.

Apocynum androsaemifolium L. Dry soil, common.—Pittsburg, west of Indian Stream, *P.* 11068 = *M.* 3763 (1907); (Errol); (Stratford); (Stark); (Milan); (Success); (Berlin); (Dalton); Whitefield, *Deane* (1897), *M.* 4395 (1908); (Carroll); (Jefferson); Randolph, *Williams* (1895, 1897), *M.* 210 (1902), 1006 (1903), *P.* 4204 (1904), *M.* 4193 (1908); Gorham, *P.* 17345 (1918); Shelburne, *Deane* (1882, 1883); Martin Location, *P.* 14354 (1913); (Bean Purchase).

Apocynum medium Greene. Gravelly shores, etc., occasional.—Pittsburg, *F. & P.* 16997 (1917); Dalton, *P.* 17383 (1919).

Apocynum cannabinum L. Gravelly or sandy shores of the Androscoggin system, common.—Dartmouth College Grant, Gorge of Diamond River, *M.* 3205 (1906), *P.* 10617 (1907); Gorham, *P.* 12199 (1909); Shelburne, *C. E. Faxon* (no date), *Deane* (1882, 1883), *P.* 11332 = *M.* 4168 (1908), *Deane* (1914, 1919).

ASCLEPIADACEAE (MILKWEED FAMILY).

ASCLEPIAS [Tourn.] L. MILKWEED.

Asclepias incarnata L. SWAMP MILKWEED. Swamps, not common.—Stratford, *P.* 17712 (1919); Lancaster, Coös Junction, *P.* 12107 (1909); Cambridge, Lake Umbagog, *P.* 16545 (1915); Shelburne, *Deane* (1883, 1916).

Asclepias incarnata L., var. **pulchra** (Ehrh.) Pers. Rare.—Jefferson, Little Cherry Pond, *P.* 13001 (1910).

ASCLEPIAS SYRIACA L. COMMON MILKWEED. Frequently adventive.—Colebrook, *P.* 10945 = *M.* 4007 (1907); (Stratford); (Stark); Lancaster, *P.* 14246 (1913); (Dalton); Randolph, *P.* 16294 (1914); Gorham, *M.* 4276 (1908), *P.* 14320 (1913); Shelburne, *Deane* (1882, 1916).

CONVOLVULACEAE (CONVOLVULUS FAMILY).

CONVOLVULUS [Tourn.] L. BINDWEED.

CONVOLVULUS SEPIUM L. Adventive in waste ground, etc., frequent.—(Pittsburg); Colebrook, *P.* 10887 = *M.* 3927 (1907);

(Stratford); (Stark); Northumberland, *P.* 12212 (1909); Berlin, *P.* 16127 (1914); Lancaster, *P.* 12122 (1909); (Dalton); Whitefield, *Deane* (1896); (Carroll); Jefferson, *P.* 12923 (1910); Randolph, *M.* 4074 (1907); Gorham, *M.* 4238 (1908); Shelburne, *Deane* (1882, 1883, 1916); Martin Location, *P.* 12186 = *M.* 4573 (1909).

CUSCUTA [Tourn.] L. Dodder.

Cuscuta Gronovii Willd. Low thickets, very local.—Shelburne, *Deane* (1915, 1916), *P.* 17786 (1919).

BORAGINACEAE (BORAGE FAMILY).

CYNOGLOSSUM [Tourn.] L. Hound's Tongue.

Cynoglossum boreale Fern. Rich woods, local.—Lancaster, Mt. Prospect, *P.* 14219 (1913); Shelburne, *Miss H. C. Blaney* (1912).

LAPPULA [Rivinius] Moench. Stickseed.

Lappula echinata. Gilibert. Waste ground, rarely adventive.—Lancaster, *P.* 14546 (1913); Gorham, *P.* 11471 (1908).

AMSINCKIA Lehm.

Amsinckia barbata Greene. Rarely adventive.—Shelburne, *Deane* (1918).

SYMPHYTUM [Tourn.] L. Comfrey.

Symphytum officinale L. Roadsides, infrequently introduced.—Whitefield, *Deane* (1897); Shelburne, *Deane* (1881, 1882).

LYCOPSIS L. Bugloss.

Lycopsis arvensis L. Waste ground, rarely adventive.—Whitefield, Hazen Junction, *P.* 11428 (1908).

MYOSOTIS [Rupp.] L. Forget-me-not.

Myosotis scorpioides L. Wet ground, frequently introduced.—Pittsburg, First Lake, *P.* 10116 = *M.* 3536 (1907); (Clarksville); Northumberland, *P.* 16059 (1914); Lancaster, *P.* 12123 (1909); Dalton, *P.* 12367 (1909), 14565 = *M.* 5078 (1913), *P.* 16090 (1914); Jefferson, *P.* 16879 (1916), 16528 (1917); Randolph, *P.* 16071 (1914); Shelburne, *Deane* (1918).

Myosotis silvatica (Ehrh.) Hoffm. Rarely adventive.—Shelburne, *Deane* (1915).

Myosotis laxa Lehm.—Pittsburg, brook near Camel's Rump Mt., *P.* 19107 (1922).

VERBENACEAE (VERVAIN FAMILY).

VERBENA [Tourn.] L. Vervain.

Verbena hastata L. Blue Vervain. Damp soil, occasional.—Columbia, *P.* 16720 (1917); Stratford, *P.* 19116 (1922); Northumberland, Groveton, *P.* 17154 (1918); Lancaster, *P.* 12807 (1910); Jefferson, *P.* 10785 (1907); Randolph, *P.* 11669 (1908); Gorham, *M.* 4062 (1907); Success, *P.* 11761 = *M.* 4376 (1908); Shelburne, *Deane* (1882).

LABIATAE (MINT FAMILY).

TRICHOSTEMA L. Blue Curls.

Trichostema dichotomum L. Dry soil, rare.—Jefferson, *P.* 11451 (1908); Randolph, *P.* 9905 (1906); Gorham, *P.* 12521 (1909).

SCUTELLARIA [Rivinius] L. Skullcap.

Scutellaria lateriflora L. Mad-dog Skullcap. Damp places, common.—Dartmouth College Grant, *P.* 16233 (1914); (Millsfield); Errol, *P.* 10615 (1907); Cambridge, *P.* 18188 (1921); Stratford, *P.* 17652 (1919); Dummer, *Williams* (1895); Milan, *P.* 13795 (1912); (Lancaster); (Dalton); Whitefield, *P.* 11560 (1908); (Carroll); (Jefferson); Randolph, *Williams* (1897), *P.* 10728 (1907); Gorham, *M.* 4058 (1907), 4280 (1908); Shelburne, *Deane* (1881, 1883), *P.* 11674 (1908), *M.* 4872 (1911), *Deane* (1914).

Scutellaria epilobiifolia Hamilton (*S. galericulata* Am. authors, not L.; *cf. Rhod.* 23 (1921), 86). Borders of ponds, etc., frequent.—Pittsburg, Second Lake, *M.* 3607 (1907); Dartmouth College Grant, *P.* 16202 (1914); Stewartstown, Buck Pond, *F. & P.* 16607 (1917); Colebrook, *P.* 10915 = *M.* 4006 (1917); Columbia, Fish Pond, *P.* 10483 (1907), Lime Pond, *P.* 10468 = *M.* 3828 (1907); (Errol); (Milan); Success, Success Pond, *P.* 10739 (1907); Berlin, *P.* 10677 (1907), 14449 (1913); Whitefield, *Deane* (1897);

Randolph, *P.* 17937 (1920); Gorham, *P.* 17404 (1919); Shelburne, *Deane* (1881, 1882, 1914).

NEPETA [Rivinius] L. Cat Mint.

Nepeta Cataria L. Catnip. Occasional near houses.—Columbia, *P.* 13984 (1912); Lancaster, *P.* 14516 (1913); Randolph, *P.* 11482 (1908); Berlin, *P.* 11638 = *M.* 4478 (1908); Shelburne, *Deane* (1881), *P.* 11672 (1908); Martin Location, *P.* 17217 (1918).

Nepeta hederacea (L.) Trevisan. Gill-over-the-Ground. Adventive in damp places, occasional.—Carroll, *P.* 16813 (1916); Shelburne, *P.* 11322 = *M.* 4165 (1908), *Deane* (1916).

Nepeta hederacea (L.) Trevisan, var. parviflora (Benth.) Druce · *Rhod.* 23 (1921), 289). Occasionally adventive.—Colebrook, *F.* & *P.* 16628 (1917); Stratford, *P.* 13556 (1912); Gorham, *P.* 17215 (1918).

PRUNELLA L. Self-heal.

Prunella vulgaris L. Occasionally adventive in lawns.—Lancaster, *P.* 17277 (1918); Shelburne, *Deane* (1922).

Prunella vulgaris L., var. **lanceolata** (Barton) Fern. (including f. *iodocalyx* Fern.; *cf.* (*Rhod.* 15 (1913), 183–184). Woods, roadsides, etc., common.—Pittsburg, First Lake, *P.* 10194 = *M.* 3531 (1907), near Canaan line, *M.* 3758, 3759 (1907); Clarksville, *P.* 10982 = *M.* 3765 (1907); Dartmouth College Grant, *P.* 16284 (1914); (Millsfield); (Columbia); (Stratford); Milan, *P.* 13834 (1912); (Success); Berlin, *P.* 16698 (1916); Lancaster, *P.* 14176 (1913); Dalton, *P.* 16096 (1914); Whitefield, *Deane* (1897); Carroll, *P.* 14369 (1913), Crawford's, *Miss S. Minns* (no date), *Williams* (1895); (Jefferson); Randolph, *Williams* (1897), *M.* 212, 262 (1902), 986 (1903), *P.* 4180 (1904), *M.* 4250 (1908), 4602 (1909), *P.* 16296 (1914); (Gorham); Shelburne, *Deane* (1882, 1883, 1913, 1914); Martin Location, *P.* 14315 (1913); (Pinkham Grant); (Low & Burbank Grant); Thompson & Meserve Purchase, Cape Horn, *Williams* (1897, 1903), *B. L. Robinson* (1901, 1903), Carriage Road, *F.* & *P.* 16869 (1917).

Prunella vulgaris L., var. **lanceolata** (Barton) Fern., f. **candida** Fern. (*Rhod.* 15 (1913), 184). Occasional.—Dartmouth Col-

lege Grant, Swift Diamond River valley, *P.* 16132 (1914); Clarksville, *P.* 10982 = *M.* 3764 (1907); Stratford, *F. & P.* 16822 (1917); Northumberland, *F. & P.* 16833 (1917); Randolph, *A. W. Evans* (1917).

Prunella vulgaris L., var. **lanceolata** (Barton) Fern., f. **rhodantha** Fern. (*Rhod.* 15 (1913), 185). Occasional.—Pittsburg, near Canaan line, *P.* 10992 = *M.* 3760 (1907)—the type collection of this form; Colebrook, *P.* 11048 = *M.* 3792 (1907), *F. & P.* 17025 (1917); Northumberland, *P.* 12136 (1909); Lancaster, *P.* 14201 (1913), *F. & P.* 16668 (1917); Carroll, *P.* 14367 (1913); Randolph, *P.* 11188 (1908); Berlin, *P.* 16510 (1915).

GALEOPSIS L. Hemp Nettle.

Galeopsis Tetrahit L. Waste places, logging roads, etc., common.—Cambridge, *Deane* (1916); (Errol); Randolph, *M.* 1932 (1904), 4081 (1907), *P.* 12073 (1909); Jefferson, *W. Boott* (1873); Shelburne, *Deane* (1881, 1914, 1918, 1919).

Galeopsis Tetrahit L., var. bifida (Boenn.) Lej. & Court. (*cf. Rhod.* 12 (1910), 142). Similar localities, more common.—Colebrook, *P.* 1128 (1901); Randolph, *Williams* (1896), *M.* 1378 (1903), *P.* 4082, 4203 (1904), 12771 (1910); Green Grant, *W. Boott* (1855); Jefferson, *W. Boott* (1873); Whitefield, *Deane* (1897); Carroll, Bretton Woods, *Deane* (1897); Shelburne, *Deane* (1882, 1884, 1918).

LEONURUS L. Motherwort.

Leonurus Cardiaca L. Adventive in waste ground, frequent.—Pittsburg, First Lake, *Mrs. A. F. Stevens* (1895); (Stratford); (Northumberland); Stark, *P.* 17477 (1919); Milan, *P.* 13952 (1912); Lancaster, *P.* 17115 (1918); Jefferson, *P.* 10781 (1907); Randolph, *P.* 12070 (1909); (Gorham); Shelburne, *P.* 11673 (1908), *Deane* (1918); (Martin Location).

STACHYS [Tourn.] L. Hedge Nettle.

Stachys tenuifolia Willd., var. **aspera** (Michx.) Fern. Rare.—Stratford, riverbank, *P.* 17705 (1919).

Stachys palustris L., var. homotricha Fern. (*cf. Rhod.* 23 (1921), 289). Infrequently adventive in fields, etc., and probably

native in the Connecticut valley.—Stratford, *F. & P.* 17026 (1917); Success, field near base of Mt. Goose-eye, *P.* 14597 (1913); Randolph, *P.* 17189 (1918); Gorham, *P.* 16323 (1914).

MONARDA L. Horse Mint.

Monarda didyma L. Bee Balm. Rare garden escape.—Errol, *Williams* (1895), *P.* 16525 (1915).

HEDEOMA Pers. Mock Pennyroyal.

Hedeoma pulegioides (L.) Pers. Pastures, rather local.—Randolph, *Williams* (1896), *P.* 1129 (1902), 17864 (1920); Shelburne, *Deane* (1884), *P.* 11666 (1908), *Deane* (1913).

SATUREJA [Tourn.] L. Calamint.

Satureja vulgaris (L.) Fritsch. Basil. Banks and thickets; most frequent in the calcareous districts.—Pittsburg, First Lake, *P.* 10095 = *M.* 3666 (1907), near Canaan line, *P.* 11018 (1907); (Clarksville); Stewartstown, *P.* 10085 = *M.* 3687 (1907); Colebrook, *P.* 13930 (1912); Columbia, *M.* 3870 (1907); Stark, Devil's Slide, *P.* 17456 (1919); Dummer, *P.* 16220 (1914); Lancaster, *P.* 12793 (1910); Hadley Grant, Hart Ledge, *P.* 16617 (1915).

THYMUS [Tourn.] L. Thyme.

Thymus Serpyllum L. Rarely adventive.—Jefferson, *P.* 16866 (1916).

LYCOPUS [Tourn.] L. Water Horehound.

Lycopus uniflorus Michx. Bugle Weed. Low ground, common.—(Pittsburg); Dartmouth College Grant, *P.* 16242 (1914); (Errol); (Columbia); (Stratford); (Success); (Berlin); (Dalton); (Carroll); Jefferson, *W. Boott* (1874), *M.* 136 (1901); Randolph, *Williams* (1897), *P.* 4030, 4038, 4039 (1904), *M.* 4071 (1907); (Gorham); Shelburne, *Deane* (1881, 1882); (Pinkham Grant); Bean Purchase, *M.* 5059 (1913).

Lycopus americanus Muhl. Damp soil, occasional.—Colebrook, *P.* 10921 = *M.* 4000 (1907), *F. & P.* 16689 (1917); Stratford, *P.* 19115 (1922); Milan, *P.* 13860 (1912); Whitefield, *Deane* (1897); Randolph, *J. R. Churchill* (1889), *Williams* (1896), *P.*

1134 (1902); Gorham, *P.* 4142 (1904); Shelburne, *Deane* (1881, 1914).

MENTHA [Tourn.] L. MINT.

MENTHA PIPERITA L. PEPPERMINT. Rarely adventive in wet places.—Whitefield, Burns Pond, *P.* 14592 = *M.* 5030 (1913).

MENTHA CARDIACA Gerarde. Occasionally adventive in wet places.—Lancaster, *P.* 14511 (1913); Randolph, *P.* 11793 (1908); Gorham, *P.* 16922 (1916); Martin Location, *P.* 12845 (1910), 19137 (1922); Shelburne, *C. E. Faxon* (no date), *P.* 1137 (1901), *Deane* (1914).

Mentha arvensis L. Damp soil, common.—(Clarksville); Columbia, *P.* 13974 (1912); (Errol); (Cambridge); Whitefield, *M.* 4349 (1908); (Jefferson); Randolph, *M.* 354 (1902), *P.* 12256 (1909); Gorham, *P.* 11441 (1908), 12894 (1910); Shelburne, *Deane* (1914).

Mentha arvensis L., var. **canadensis** (L.) Briq. Damp soil, common.—(Pittsburg); Dartmouth College Grant, *P.* 16139 (1914); (Stewartstown); (Berlin); Lancaster, *P.* 12826 (1910); Whitefield, *M.* 4428 (1908); Jefferson, *P.* 16834 (1916); Randolph, *Williams* (1897), *P.* 9917 (1906); Shelburne, *Deane* (1883, 1914).

Mentha arvensis L., var. **glabrata** (Benth.) Fern. Rare.—Shelburne, *Deane* (1915).

Mentha arvensis L., var. **lanata** Piper. Rare.—Stewartstown, *F. & P.* 16604 (1917); Milan, *P.* 13697 (1912).

SOLANACEAE (NIGHTSHADE FAMILY).

SOLANUM [Tourn.] L.

SOLANUM TUBEROSUM L. POTATO. Rarely adventive.—(Colebrook); Shelburne, *Deane* (1919).

LYCOPERSICUM Hill. TOMATO.

LYCOPERSICUM ESCULENTUM Mill. Dumps, rare.—Berlin, *P.* 18232 (1921).

PHYSALIS L. GROUND CHERRY.

PHYSALIS HETEROPHYLLA Nees. Locally adventive.—Gorham, *P.* 14182 (1913), 16608 (1915), 16918 (1916).

PHYSALIS HETEROPHYLLA Nees, var. AMBIGUA (Gray) Rydb. Locally adventive.—Shelburne, *Deane* (1914).

SCROPHULARIACEAE (FIGWORT FAMILY).

VERBASCUM [Tourn.] L. MULLEIN.

VERBASCUM THAPSUS L. COMMON MULLEIN. Adventive in old fields, etc., frequent.—Clarksville, *M.* 3699 (1907); (Columbia); (Stratford); (Stark); (Milan); (Berlin); (Lancaster); (Whitefield); (Jefferson); Randolph, *Williams* (1896), *M.* 350 (1902), 4253 (1908), *P.* 12177 (1909); (Gorham); Shelburne, *Deane* (1882, 1883, 1914).

VERBASCUM BLATTARIA L. MOTH MULLEIN. Whitefield, *Deane* (1897).

VERBASCUM NIGRUM L. Rare escape.—Jefferson, roadside, Highlands, *P.* 19062 (1922).

LINARIA [Tourn.] Hill. TOADFLAX.

LINARIA VULGARIS Hill. BUTTER AND EGGS. Fields and waste places, occasionally adventive.—Colebrook, *P.* 10871 = *M.* 4012 (1907); (Columbia); Milan, *P.* 13870 (1912); Lancaster, *P.* 12213 (1909); Carroll, *P.* 16568 (1915); Randolph, *P.* 4034 (1904), *M.* 5097 (1913); Gorham, *M.* 4268 (1908), *P.* 12889 (1910), 16443 (1915); Shelburne, *Deane* (1916).

LINARIA CANADENSIS (L.) Dumont. Frequently adventive along railroad tracks.—Stewartstown, *P.* 11000 (1907); Columbia, *P.* 17679 (1919); Lancaster, *P.* 12269 (1909); Whitefield, *M.* 4345 (1908); Carroll, Quebec Junction, *P.* 12701 (1910); Jefferson, *P.* 12866 (1910); (Randolph). .

LINARIA MINOR (L.) Desf. Occasionally adventive along railroad tracks.—Stewartstown, *F. & P.* 16944 (1917); Colebrook, *P.* 17811 (1920); Columbia, *P.* 17720 (1919); Jefferson, Riverton, *P.* 17237 (1918); Berlin, *P.* 12724 (1910).

SCROPHULARIA [Tourn.] L. FIGWORT.

SCROPHULARIA LANCEOLATA Pursh (*S. leporella* Bicknell; *cf. Torreya*, 22 (1922), 82). Frequently adventive in meadows and clearings.—Dartmouth College Grant, *P.* 16255 (1914); Mills-

field, *P.* 18210 (1921); Columbia, *F. & P.* 16585 (1917); Milan, *P.* 17399, 17464 (1919); Success, *P.* 10675 (1907), *M.* 4320 (1908); Lancaster, *P.* 12808 (1910); Dalton, *P.* 14595 = *M.* 5009 (1913); Carroll, *P.* 12712 (1910), 16569 (1915); Jefferson, *P.* 10565 (1907); Randolph, *P.* 12102 (1909); Gorham, *P.* 12520 (1909), 14442 (1913); Shelburne, *B. L. Robinson & Williams* (1903), *P.* 11321 = *M.* 4142 (1908).

PENTSTEMON [Mitchell] Ait. Beard-tongue.

Pentstemon hirsutus (L.) Willd. Rarely adventive.—Shelburne, near Moose Pond, *R. A. Ware* (1923).

Pentstemon laevigatus Ait. Occasionally adventive in fields.—Randolph, *H. T. Burbank* (1915), *P.* 16724, 16726 (1917).

Pentstemon laevigatus Ait., var. digitalis (Sweet) Gray. Often adventive.—Gorham, *P.* 12519 (1909); Shelburne, *Mrs. G. N. McMillan* (1908), *Deane* (1908, 1910); Martin Location, *P.* 14280 (1913).

CHELONE [Tourn.] L. Turtlehead.

Chelone glabra L. Damp soil, common.—(Pittsburg); Clarksville, *F. & P.* 17008 (1917); (Stewartstown); (Colebrook); (Stratford); Northumberland, Lost Nation, *Williams* (1906); (Stark); Milan, *P.* 13855 (1912); (Berlin); (Lancaster); Whitefield, *Deane* (1897), *P.* 11495 = *M.* 4357 (1908); (Carroll); (Jefferson); Randolph, *Williams* (1895), *M.* 352, 353 (1902), *P.* 9915 (1906); (Gorham); Shelburne, *Deane* (1883, 1913); (Pinkham Grant).

Chelone glabra L., f. **rosea** Fern. (*Rhod.* 18 (1916), 72). Rare.—Clarksville, *F. & P.* 17009 (1917).

MIMULUS L. Monkey Flower.

Mimulus ringens L. Wet places, occasional.—Dartmouth College Grant, *P.* 16142 (1914); Colebrook, *P.* 10884 = *M.* 4011 (1907); Northumberland, *P.* 12139 (1909); (Berlin); Lancaster, *P.* 12112 (1909); Dalton, *P.* 11602 = *M.* 4383 (1908); (Jefferson); Shelburne, *Deane* (1881, 1882, 1883, 1916), *P.* 11319 = *M.* 4141 (1908).

ILYSANTHES Raf. False Pimpernel.

Ilysanthes dubia (L.) Barnhart. Wet places, frequent.—Pittsburg, *P.* 17694 (1919); Errol, *F. & P.* 16988 (1917); (Strat-

ford); (Berlin); Lancaster, *P.* 12799 (1910); Dalton, *P.* 11596 = *M.* 4443 (1908), *P.* 12296 (1909); Jefferson, *P.* 10790 (1907); Randolph, *P.* 4000 (1904); Gorham, *P.* 16592 (1915).

GRATIOLA [Rupp.] L. Hedge Hyssop.

Gratiola aurea Muhl. Wet shores, rare.—Errol, Lake Umbagog, *P.* 10585 (1907).

DIGITALIS [Tourn.] L. Foxglove.

Digitalis purpurea L. Rare garden escape.—Randolph, *P.* 17135 (1918).

VERONICA [Tourn.] L. Speedwell.

Veronica americana Schwein. American Brooklime. Wet places, frequent.—Pittsburg, near Second Lake, *P.* 10000½ = *M.* 3520 (1907); Dartmouth College Grant, *P.* 16131 (1914); (Clarksville); Stewartstown, *M.* 3671 (1907); Colebrook, *F.* & *P.* 16564 (1917); Columbia, *M.* 3839 (1909); Dummer, *P.* 12662 (1910); Success, *P.* 11769 = *M.* 4317 (1908), *P.* 16808 (1917); Lancaster, *S. N. F. Sanford* (1914); Jefferson, *P.* 14186 (1913); Randolph, *P.* 1205 (1900), *M.* 1022 (1903), *P.* 5407 (1904); Gorham, *P.* 16907 (1916); Bean Purchase, Carter Notch, *W. Boott* (1855), *P.* 12906 (1910).

Veronica scutellata L. Marsh Speedwell. Wet places, frequent.—Pittsburg, First Lake, *P.* 10199 = *M.* 3595 (1907); Atkinson & Gilmanton Academy Grant, *P.* 12591 (1910); (Columbia); (Errol); Stratford, *P.* 17721 (1919); Northumberland, *P.* 16476 (1917); Dummer, *Williams* (1895); Milan, *P.* 13712 (1912); (Berlin); Lancaster, *P.* 12145 (1909); Dalton, *P.* 17575 (1919); (Low & Burbank Grant); Randolph, *Williams* (1897), *P.* 12328 (1909), 12679 (1910); Gorham, *P.* 16361 (1915); Shelburne, *Deane* (1883), *P.* 12198 (1909).

Veronica officinalis L. Common Speedwell. Pastures and wood roads, occasionally adventive.—Millsfield, *P.* 18190 (1921); Success, *P.* 14137 (1913); Low & Burbank Grant, Ravine of the Castles, *P.* 16697 (1916); Martin Location, *P.* 14271 (1913); Pinkham Grant, Crystal Cascade, *P.* 17082 (1917).

Veronica alpina L., var. **unalaschcensis** C. & S. (but *cf. Rhod.* 23 (1921), 15). Alpine brooks, local.—Thompson & Meserve Pur-

chase, Great Gulf, *E. & C. E. Faxon* (1885, 1887), *Williams* (1893), *M.* 4532 (1909); Sargent Purchase, Tuckerman Ravine, *W. Boott* (1855), *H. Mann* (1862), *W. H. Manning* (1881), *E. & C. E. Faxon* (1877, 1885), *Miss S. Minns* (1888), *J. R. Churchill* (1889, 1890), *Williams* (1895), *E. D. Merrill* (1896), *P.* 1202 (1900), 1203 (1902), *M.* 261 (1902), *P.* 10730 (1907), *M.* 4576 (1909); Cutts Grant, Oakes Gulf, *E. & C. E. Faxon* (1889), *Williams* (1896), *B. L. Robinson* (1901), *P.* 12028 = *M.* 4551 (1909); alpine region, not definitely located, *Oakes* (no date), *C. G. Pringle, J. A. Allen* (1878). A report of this species from Low & Burbank Grant, King Ravine, needs verification.

Veronica serpyllifolia L. Grassy places, frequent.—Pittsburg, near Third Lake, *P.* 10331 = *M.* 3496 (1907), Second Lake, *P.* 10275 = *M.* 3442 (1907); Stratford, *P.* 13594 (1912); Milan, *P.* 13812 (1912); (Success); (Jefferson); Randolph, *M.* 988 (1903), *P.* 5377 (1904), *Mrs. G. F. Moore* (1905), *M.* 3188 (1906), 3246, *P.* 10049 (1907); Gorham, *Deane* (1909); Shelburne, *Deane* (1883, 1916).

Veronica humifusa Dickson. Damp wood roads, etc., frequent.—Atkinson & Gilmanton Academy Grant, Hellgate, *P.* 12592 (1910); Lancaster, Mt. Prospect, *P.* 16920 (1917); Carroll, Bretton Woods, *P.* 11271 (1908); Crawford Purchase, *P.* 11256 (1908); Randolph, *P.* 16431 (1917); Gorham, *P.* 16430 (1917).

Veronica arvensis L. Corn Speedwell. Rarely adventive.—Whitefield, *Deane* (1897).

Veronica persica Poir. (*Rhod.* 21 (1919), 102; 23 (1921), 20). Rare garden weed.—Randolph, *Mrs. J. W. Ripley* (1916), *P.* 17142 (1919).

CASTILLEJA Mutis. Painted Cup.

Castilleja pallida (L.) Spreng., var. **septentrionalis** (Lindl.) Gray. Heads of alpine ravines, locally abundant; rarely descending to lower levels.—Thompson & Meserve Purchase, Mt. J. Q. Adams, *P.* 9907 (1906), near Peabody Spring, *P.* 10846 (1907), Mt. Clay, *W. Boott* (1855), *Williams* (1897), Great Gulf, *E. & C. E. Faxon* (1887), *Williams* (1895), *P.* 12037 = *M.* 4568 (1909), Carriage Road, *Deane* (1884), *B. L. Robinson* (1901), *P.* 10545 (1907); Sargent Purchase, Alpine Garden, *E. & C. E.*

Faxon (1890), Huntington Ravine, *F. & P.* 16849 (1917), Tuckerman Ravine, *H. Mann* (1862), *J. A. Allen* (1876), *Miss S. Minns* (no date), *W. H. Manning* (1884), *Miss H. L. Brown* (1885), *E. & C. E. Faxon* (1885, 1890), *J. R. Churchill* (1889), *Williams* (1895), *E. D. Merrill* (1896), *M.* 172 (1901), 1060 (1903), 4565 (1909); Cutts Grant, Oakes Gulf, *E. & C. E. Faxon* (1889, 1890), *Williams* (1893), *B. L. Robinson* (1901), *P.* 12024 = *M.* 4550 (1909); Mt. Washington, not definitely located, *Oakes* (no date), *W. Boott* (1853), *W. F. Flint & J. H. Huntington* (1876), *W. P. Rich* (1880), *J. R. Churchill* (1890); Pinkham Grant, roadside near Crystal Cascade, at 2000 ft., *P.* 12051 (1909), 19177 (1923).

MELAMPYRUM [Tourn.] L. Cow Wheat.

Melampyrum lineare Lam. At lower levels occasional in dryish open woods; locally occurring on boggy mountain tops in mossy or peaty soil.—Errol, near Errol Dam, *P.* 16217 (1914); Stratford, Percy Peaks, *P.* 12748 (1910); Success, Mt. Success, *P.* 11313 (1908); Berlin, *P.* 16506 (1915), Mt. Forist, *P.* 16118 (1914); Dalton, *P.* 17570 (1919); Gorham, *P.* 12773 (1910), Mt. Hayes, *P.* 12822 (1910); Shelburne, *Deane* (1885), *P.* 11159 = *M.* 4104 (1908); Bean Purchase, Imp Camp, *P.* 16765 (1917); Sargent Purchase, Carriage Road, *P.* 12830 (1910); Ammonoosuc Ravine, *P.* 16762 (1916), Mt. Resolution, *P.* 14049 (1912); Bean Grant, Mt. Clinton, *Williams* (1895), Mt. Webster, *P.* 11743 (1908); alpine region, not definitely located, *Oakes* (no date); Hadley Grant, Mt. Crawford, *P.* 11732 (1908), Mt. Hope, *P.* 16473 (1915).

EUPHRASIA [Tourn.] L. Eyebright.

Euphrasia Oakesii Wettst. Alpine region, very local.—Cutts Grant, head of Oakes Gulf and slopes of Mt. Monroe, *Oakes* (no date), *E. & C. E. Faxon* (1877, 1879, 1881, 1891), *C. G. Pringle* (1878), *W. H. Manning* (1881), *Williams* (1893, 1901), *B. L. Robinson* (1901), *W. W. Eggleston* (1901), *P.* 1174 = *M.* 298 (1902).

Euphrasia Williamsii Robinson. Alpine region, very local on the east side of Mt. Washington.—Thompson & Meserve Purchase, Cape Horn, *E. & C. E. Faxon* (1896), *Williams* (1896, 1901), *P.* 4107, 4863 (1904), 10595 (1907); Sargent Purchase, Alpine Garden, *Williams & B. L. Robinson* (1901), Lion's Head,

P. 12527 (1909); Mt. Washington, not definitely located, *W. F. Flint & J. H. Huntington* (1876).

Euphrasia canadensis Townsend. Pastures and roadsides, very local.—Gorham, *P.* 16742 (1916); Green Grant, about Glen House, *W. Boott* (1865), *J. A. Allen* (1878), *M.* 1424 (1903), 4300 (1908), *P.* 10761 (1907), 11550 (1908); Pinkham Grant, *Mrs. E. Bartow* (1888), *F. F. Forbes* (1902).

RHINANTHUS L. Yellow Rattle.

Rhinanthus oblongifolius Fern. Heads of alpine ravines, local.—Thompson & Meserve Purchase, Carriage Road, *J. Robinson* (1901); Sargent Purchase, Lion's Head, *E. & C. E. Faxon* (1890); Cutts Grant, Oakes Gulf, *E. & C. E. Faxon* (1877, 1879, 1890), *Williams* (1893, 1896, 1907), *P.* 16573 (1915); Mt. Washington, not definitely located, *W. F. Flint & J. H. Huntington* (1876).

LENTIBULARIACEAE (BLADDERWORT FAMILY).

UTRICULARIA L. Bladderwort.

Utricularia geminiscapa Benj. (*U. clandestina* Nutt.; *cf. Rhod.* 23 (1921), 290). Muddy shores, rare.—Stewartstown, Ladd Pond, *F. & P.* 17036 (1917), logan, *F. & P.* 17044 (1917); Cambridge, Lake Umbagog, *P.* 18205, 18206 (1921); Berlin, Dead River, *P.* 17832 (1920).

Utricularia vulgaris L., var. **americana** Gray. Ponds and slow streams, frequent.—Pittsburg, First Lake, *W. C. Kendall, E. L. Goldsborough, & A. Doolittle* (1904); Stewartstown, *F. & P.* 17000 (1917); Northumberland, Horseshoe Pond, *P.* 17273 (1918); Lancaster, Baker Pond, *P.* 17269 (1918); Dalton, Scott Junction, *P.* 12355 (1909); Whitefield, Weed Pond, *P.* 14462 (1913); Randolph, Pond of Safety, *P.* 4010 (1904); Gorham, *P.* 17405 (1919); Berlin, Dead River, *P.* 4703 (1904); Shelburne, *Deane* (1914).

Utricularia minor L. Shallow water, rather rare.—Stewartstown, wet meadow, *P.* 10396 = *M.* 3973 (1907), Ladd Pond, *P.* 11104 = *M.* 3958 (1907), *F. & P.* 16634, 17037 (1917); Lancaster, Baker Pond, *P.* 17242 (1918); Carroll, pool west of Twin Mt., *P.* 17562 (1919).

Utricularia intermedia Hayne. Shallow water, frequent.—Stewartstown, Buck Pond, *F. & P.* 16802 (1917), 17045 (1917); Columbia, Lime Pond, *P.* 10867 = *M.* 3857 (1907), *F. & P.* 16824 (1917); Milan, Mud Pond, *P.* 13754 (1912); Lancaster, Clark Pond, *P.* 12379 (1909); Berlin, Head Pond, *P.* 14475 (1913), Dead River, *P.* 14477 (1913).

Utricularia cornuta Michx. Pond shores, occasional.—Whitefield, Weed Pond, *P.* 14410 (1913); Carroll, Ammonoosuc Lake, *Williams* (1895); Berlin, Head Pond, *P.* 14474 (1913), 19064 (1922); Shelburne, Wheeler Bog, *Deane* (1881), Dream Lake, *P.* 19212 (1923).

OROBANCHACEAE (BROOM-RAPE FAMILY).

Epifagus virginiana (L.) Bart. Beech-drops. Beech woods, frequent.—Millsfield, *P.* 18191 (1921); Carroll, Crawford's, *Miss S. Minns* (no date); Randolph, *Miss E. W. Cook* (1893), *M.* 141 (1901), *P.* 4037 (1904), 18087 (1920) plants shining purplish black; Gorham, *P.* 16909 (1916), 18227 (1921), 18226 (1921) plants straw-colored; Shelburne, *Deane* (1883, 1884, 1916), *J. J. Greenough* (1887).

OROBANCHE [Tourn.] L. Broom-rape.

Orobanche uniflora L. Damp soil, rare.—Randolph, *P.* 10356 = *M.* 3305 (1907); Gorham, *P.* 16718 (1916).

PLANTAGINACEAE (PLANTAIN FAMILY).

PLANTAGO [Tourn.] L. Plantain.

Plantago major L. Roadsides and yards, common.—Pittsburg, First Lake, *M.* 3561 (1907); (Errol); Millsfield, *P.* 16318 (1914) teratological form, the spikes replaced by leafy rosettes; (Stratford); (Stark); Milan, *P.* 13815 (1912); (Success); (Berlin); (Lancaster); (Dalton); Carroll, *P.* 14400 (1913); (Jefferson); (Low & Burbank Grant); Randolph, *P.* 1219 (1902), *M.* 955 (1903), *P.* 12185 (1909); Gorham, *P.* 16476 (1915); Shelburne, *Deane* (1883, 1914); (Pinkham Grant); Sargent Purchase, summit of Mt. Washington, *Williams* (1901).

Plantago major L., var. **asiatica** (L.) Dene. Local.—Colebrook, Beaver Falls, *F. & P.* 16568 (1917).

Plantago major L., var. nana Tratt. Rare.—Success, abandoned lumber railway, *P.* 11762 = *M.* 4330 (1908).

Plantago Rugelii Dene. Roadsides, etc., frequent.—Millsfield, *P.* 18189 (1921); (Colebrook); Lancaster, *P.* 12313 (1909); Jefferson, *P.* 16732 (1917); (Randolph); (Berlin); Gorham, *P.* 16429 (1915).

Plantago lanceolata L. Rib Grass. Occasionally adventive.—Pittsburg, west of Indian Stream, *P.* 10994 = *M.* 3744 (1907); Errol, *P.* 16312 (1914); Stratford, *P.* 13607 (1912); Randolph, *P.* 16862 (1916); Shelburne, *Mrs. G. N. McMillan* (1912), *Deane* (1918).

Plantago aristata Michx. Rarely adventive.—Carroll, *P.* 11445 (1908); Randolph, *P.* 4116 (1904), 16911 (1917).

RUBIACEAE (MADDER FAMILY).

GALIUM L. Bedstraw.

Galium kamtschaticum Steller. Cold damp woods, occasional.—Pittsburg, Second Lake, *P.* 10249 = *M.* 3438 (1907); Stewartstown, Little Diamond Pond, *P.* 12628 (1910); Carroll, Crawford's, *Miss S. Minns* (1885, 1888); Randolph, near Ice Gulch, *P.* 1231 (1902); (Low & Burbank Grant); Sargent Purchase, Tuckerman Ravine, *J. R. Churchill*, *Williams* (1895), Giant's Stairs, *P.* 14043 (1912); Cutts Grant, *M.* 1077 (1903); Bean Grant, Mt. Clinton, *E. & C. E. Faxon* (1879), *Williams* (1895).

Galium lanceolatum Torr. Rocky woods, local.—Lancaster, Mt. Tug, *P.* 16735 (1916), Mt. Prospect, *P.* 14216 (1913); Dalton, Dalton Mt., *P.* 11584 = *M.* 4416 (1908); Shelburne, *Deane* (1916).

Galium boreale L. Meadows, etc., occasionally adventive.—Whitefield, *P.* 16064 (1914); Jefferson, *P.* 18213 (1921); Randolph, *M.* 4042 (1907), *P.* 12741 (1910), 17853 (1920).

Galium palustre L. Wet ditches, etc., occasional.—Northumberland, *P.* 16060 (1914); Whitefield, *P.* 14235 (1913), 18077 (1921); Jefferson, *P.* 16710 (1916); Randolph, *M.* 1135 (1903), *P.* 16709 (1916); Gorham, *P.* 12763 (1910).

Galium trifidum L. Cold bogs, etc., occasional.—Stewartstown, *F. & P.* 16795 (1917), Ladd Pond, *F. & P.* 16774 (1917);

Columbia, Fish Pond, *F. & P.* 16737 (1917); Dummer, *F. & P.* 16548 (1917); Jefferson, Cherry Pond, *P.* 11462 (1908).

Galium Claytoni Michx. Damp places, common.—Pittsburg, First Lake, *M.* 3584 (1907), near Canaan line, *M.* 3776 (1907); Dartmouth College Grant, *P.* 16257 (1914); Stewartstown, *M.* 3672 (1907); Colebrook, *F. & P.* 16929 (1917); (Columbia); (Stratford); (Stark); (Northumberland); Milan, *P.* 13808 (1912); (Success); Berlin, *P.* 17076 (1917); Lancaster, *P.* 12198 (1909); Whitefield, *Deane* (1896, 1897); Carroll, *P.* 12694 (1910), Crawford's, *Williams* (1895); Jefferson, *P.* 11462 (1908), 16878 (1916), 16519 (1917), 17328 (1918); Randolph, *Williams* (1896), *M.* 3335 (1907), *P.* 12010, 12226 (1909); Martin Location, *P.* 14303 (1913); Shelburne, *Deane* (1881, 1882, 1883); Bean Purchase, *M.* 5060 (1913).

Galium Claytoni Michx., var. **subbiflorum** Wiegand (*Rhod.* 12 (1910), 228—230). Rare.—Columbia, Lime Pond, *F. & P.* 16817 (1917).

Galium asprellum Michx. Rough Bedstraw. Alluvial ground, common.—Pittsburg, First Lake, *Mrs. A. F. Stevens* (1895); (Stewartstown); Dartmouth College Grant, *P.* 16187 (1914); (Millsfield); (Colebrook); (Columbia); (Northumberland); Milan, *P.* 13705 (1912); (Success); (Carroll); Jefferson, *M.* 5008 (1913), *P.* 16851 (1916); (Low & Burbank Grant); Randolph, *M.* 245 (1902), *P.* 11624 (1908); (Gorham); Shelburne, *Deane* (1881, 1883), *G. L. Briggs* (1883).

Galium triflorum Michx. Sweet-scented Bedstraw. Moist woods, common.—Pittsburg, Second Lake, *M.* 3525 (1907), First Lake, *P.* 10126 = *M.* 3604 (1907); (Stewartstown); (Columbia); (Millsfield); (Stratford); (Northumberland); (Stark); (Success); (Lancaster); Whitefield, *Deane* (1895, 1896); (Carroll); (Jefferson); (Low & Burbank Grant); Randolph, *M.* 1050 (1903), *P.* 11189 (1908); (Gorham); Shelburne, *C. E. Faxon* (no date), *Deane* (1883, 1909); (Bean Purchase); (Sargent Purchase).

MITCHELLA L. Partridge Berry.

Mitchella repens L. Woods, common.—Colebrook, *P.* 10368 = *M.* 3934 (1907); (Columbia); (Millsfield); Stratford, *P.* 13565

(1912); (Stark); Milan, *P.* 13825 (1912); (Berlin); Lancaster, *P.* 16733 (1916); (Jefferson); Randolph, *Williams* (1896), *P.* 6092 (1904), *M.* 4452 (1908), 4526 (1909); (Gorham); Shelburne, *Deane* (1882, 1883, 1913); Martin Location, *P.* 14356 (1913); (Bean Purchase).

CEPHALANTHUS L. Buttonbush.

Cephalanthus occidentalis L. Swamps, rare.—Northumberland, *P.* 12132 (1909); Shelburne, *Deane* (1883, 1907, 1914).

HOUSTONIA L. Bluets; Innocence.

Houstonia caerulea L. Grassy places, etc., common.—(Pittsburg); Dartmouth College Grant, *P.* 12607 (1910); (Cambridge); Stratford, *P.* 13593 (1912); (Northumberland); (Stark); (Dalton); (Carroll); (Jefferson); Randolph, *M.* 989 (1903), *P.* 12021 (1909); (Gorham); Shelburne, *Deane* (1882, 1910, 1916); Martin Location, *P.* 14329 (1913), 17312 (1918); (Sargent Purchase); Cutts Grant, Oakes Gulf, *P.* 12046 (1909).

Houstonia caerulea L., var. **Faxonorum** Pease & Moore. Moist gravelly soil, alpine regions, especially at the heads of ravines, frequent.—Thompson & Meserve Purchase, Great Gulf, *P.* 11198 (1908), 12880 (1910); Sargent Purchase, summit of Mt. Washington, *Deane* (1897), Alpine Garden, *P.* 10558 (1907), Huntington Ravine, *F. & P.* 16752 (1917), Tuckerman Ravine, *M.* 291 (1902), 4047 (the type specimen of the variety), *P.* 10732 (1907), 11502 (1908), 12048 = *M.* 4580 (1909), 5084 (1913), Bigelow Lawn, *Williams* (1895), Boott Spur, *Williams* (1893); Cutts Grant, Oakes Gulf, *G. G. Kennedy* (1890), *Williams* (1898), *M.* 4553, 4574 (1909).

CAPRIFOLIACEAE (HONEYSUCKLE FAMILY).

DIERVILLA [Tourn.] Mill. Bush Honeysuckle.

Diervilla Lonicera Mill. Rocky woods and banks, common.—Pittsburg, near Third Lake, *P.* 10305 (1907), First Lake, *P.* 10965 = *M.* 3636 (1907); (Colebrook); (Columbia); (Stratford); (Northumberland); (Stark); (Dummer); (Success); (Berlin); (Lancaster); (Dalton); Whitefield, *Deane* (1897); Jefferson, *W. Boott* (1873), *P.* 16531 (1917); Randolph, *Williams* (1897), *M.*

1001 (1903), *Mrs. G. F. Moore* (1907), *P.* 11240 (1908); Gorham, *Williams* (1897), *M.* 1048 (1903); Shelburne, *Deane* (1882, 1883, 1902); (Bean Purchase); Martin Location, *P.* 14303 (1913); (Low & Burbank Grant); (Thompson & Meserve Purchase); Sargent Purchase, Huntington Ravine, 4000 ft., *F.* & *P.* 16755 (1917), *P.* 19076 (1922).

LONICERA L. HONEYSUCKLE.

Lonicera caerulea L., var. **calvescens** Fern. & Wieg. (*Rhod.* 12 (1910), 209-211). Open bogs, frequent.—Pittsburg, Second Lake, *P.* 10176 = *M.* 3445 (1907), First Lake, *P.* 10090 = *M.* 3624 (1907); Stewartstown, *F.* & *P.* 16575 (1917), Ladd Pond, *P.* 12718 (1910); Colebrook, *F.* & *P.* 16563 (1917); Stratford, *P.* 13470 (1912); Milan, *P.* 13781 (1912); Whitefield, *P.* 14195 (1913); Randolph, *M.* 4203 (1908); Sargent Purchase, Mt. Washington, west side, *P.* 11183 (1908), Alpine Garden, *J. M. Greenman* (1898), Tuckerman Ravine, *M.* 257 (1902), *P.* 10729 (1907), Lakes of the Clouds, *E.* & *C. E. Faxon* (1886); Cutts Grant, Oakes Gulf, *Williams* (1893), *G. G. Kennedy* (1895), *J. M. Greenman* (1898), *P.* 11214 (1908).

Lonicera caerulea L., var. **villosa** (Michx.) T. & G. Bogs, frequent.—Errol, *P.* 12611 (1910); Cambridge, *P.* 12650 (1910), 16534 (1915); Success, *P.* 10640 (1907), 16555 (1917); Whitefield, *Deane* (1896); Dalton, *P.* 19048 (1922); Carroll, *P.* 12713 (1910), Crawford's, *Williams* (1895); Jefferson, *P.* 11263 (1908); Randolph, *P.* 11246 (1908); Sargent Purchase, *W. Boott* (1855), Tuckerman Ravine, *P.* 1253 (1901).

LONICERA TATARICA L. TARTARIAN HONEYSUCKLE. Rare escape.—Whitefield, near Whitefield Junction, *P.* 16086 (1914).

Lonicera canadensis Marsh. Woods, common.—Pittsburg, Third Lake, *M.* 3482 (1907); Dartmouth College Grant, *P.* 16150 (1914); Cambridge, *P.* 12651 (1910); (Millsfield); Stewartstown, *P.* 10324 = *M.* 3390 (1907); Colebrook, *P.* 10377 = *M.* 3898 (1907); Stratford, *P.* 13447 (1912); (Success); (Dalton); Whitefield, *Deane* (1895); Carroll, Fabyans, *C. E. Faxon* (1880); (Jefferson); (Low & Burbank Grant); Randolph, *Williams* (1896), *M.* 1438 (1903), 3304, *P.* 10697 (1907); Shelburne, *Deane* (1881, 1882, 1916); (Bean Purchase); (Pinkham Grant).

SYMPHORICARPOS [Dill.] Ludwig. Snowberry.

Symphoricarpos albus (L.) Blake, var. laevigatus (Fern.) Blake (*S. racemosus* Michx., var. *laevigatus* Fern.; *cf. Rhod.* 16 (1914), 118–119). Persistent and spreading around old house sites.—Whitefield, *Deane* (1897); Randolph, *P.* 5690 (1904), *M.* 4460 (1908); Berlin, *P.* 16264 (1914); Martin Location, *P.* 10683 (1907).

LINNAEA [Gronov.] L. Twin-flower.

Linnaea borealis L., var. **americana** (Forbes) Rehder. Moist woods, common.—Pittsburg, First Lake, *Mrs. A. F. Stevens* (1895), *P.* 10122 = *M.* 3611 (1907); Stewartstown, *P.* 10261 = *M.* 3401 (1907); Colebrook, *Miss M. Bell* (1889); (Millsfield); Columbia, *M.* 3840 (1907); (Northumberland); (Stark); (Milan); Success, *P.* 16553 (1917); (Berlin); Lancaster, *Deane* (1896); (Dalton); Whitefield, *Deane* (1896), *M.* 4419 (1908); Carroll, *Miss F. C. Prince* (1892), Crawford's, *Miss S. Minns* (no date); (Jefferson); Randolph, *Williams* (1896), *P.* 1252 (1899), *M.* 977 (1903), 3191 (1906), 3353 (1907); Shelburne, *C. E. Faxon* (no date), *Deane* (1881, 1882, 1883, 1914); (Bean Purchase); Martin Location, *P.* 14292 (1913); Low and Burbank Grant, Mt. Adams, *P.* 1251 (1897); Thompson & Meserve Purchase, Cape Horn, *Williams* (1897), *B. L. Robinson* (1901); Sargent Purchase, Boott Spur, *M.* 273 (1902); Cutts Grant, Oakes Gulf, *Williams* (1893); Mt. Washington, not definitely located, *W. Boott* (1853); Bean Grant, Mt. Clinton, *Williams* (1895).

VIBURNUM [Tourn.] L. Arrow-wood.

Viburnum alnifolium Marsh. Hobble Bush; Moosewood. Moist woods, common.—Pittsburg, First Lake, *P.* 10956 = *M.* 3612 (1907); (Columbia); (Millsfield); Stratford, *P.* 13479 (1912); (Success); (Berlin); Whitefield, *Deane* (1895); (Carroll); (Jefferson); (Low & Burbank Grant); Randolph, *Williams* (1895), *M.* 1428, 1451 (1903), *P.* 5380 (1904), *Mrs. G. F. Moore* (1905); (Gorham); Shelburne, *Deane* (1882, 1883); (Bean Purchase); (Pinkham Grant); (Thompson & Meserve Purchase); Bean Grant, Mt. Clinton, *Williams* (1895).

Viburnum Opulus L., var. **americanum** (Mill.) Ait. High-bush Cranberry. Low grounds, frequent.—Pittsburg, First Lake,

P. 10957 = *M.* 3619 (1907); Dartmouth College Grant, *P.* 16189 (1914); (Colebrook); (Errol); (Stratford); Milan, *P.* 13807 (1912); (Success); (Berlin); Lancaster, *Deane* (1896); Dalton, *P.* 11419 = *M.* 4367 (1908); Carroll, *P.* 14441 (1913); Jefferson, *P.* 3233 (1901), *M.* 3406 (1907); Randolph, *L. M. Watson* (1895), *P.* 1262 (1901). 10225 (1907); Gorham, *Williams* (1895), *P.* 16075 (1914); Shelburne, *Deane* (1882, 1883), *P.* 11318 = *M.* 4139 (1908).

Viburnum pauciflorum Raf. Cold woods, occasional.—Stark, Devil's Hop Yard, *P.* 16758 (1916); Randolph, Ice Gulch, *P.* 16651 (1917); Low & Burbank Grant, Valleyway, *M.* 3361 (1907); Thompson & Meserve Purchase, Great Gulf, *P.* 1266 (1902); Sargent Purchase, Tuckerman Ravine, *E. & C. E. Faxon* (1878, 1885, 1886, 1887), *C. R. Lamb* (1884), *J. R. Churchill* (1889, 1895), *Williams* (1895), *P.* 1265 (1901), *M.* 1076 (1903), *P.* 11508 (1908); Cutts Grant, Oakes Gulf, *C. E. Faxon* (1878), *Williams* (1895, 1898), *J. M. Greenman* (1898), *B. L. Robinson* (1901), *P.* 11213 (1908), 12042 (1909); alpine region, not definitely located, Oakes (no date); Bean Purchase, Carter Dome, *P.* 12902 (1910).

Viburnum acerifolium L. Dockmackie. Rocky woods in the southern part of the County, local.—Lancaster, Mt. Prospect, *P.* 14213 (1913); Dalton, *P.* 11537 = *M.* 4427 (1908); Gorham, *P.* 16079 (1914), 16904 (1916); Shelburne, *Deane* (1882, 1883), *P.* 11160 = *M.* 4148 (1908), *Deane* (1914, 1916).

Viburnum dentatum L. Arrow-wood. Wet thickets, occasional.—Cambridge, Lake Umbagog, *P.* 16540 (1915); Milan, *P.* 13786 (1912); Berlin, Dead River, *P.* 16508 (1915); Randolph, *P.* 10759 (1907); Shelburne, *Deane* (1882).

Viburnum cassinoides L. Withe-rod. Swamps and peaty open soil, frequent.—Pittsburg, First Lake, *P.* 10959 = *M.* 3618 (1907); Dartmouth College Grant, *P.* 16174 (1914); (Stewartstown); (Columbia); (Cambridge); (Dummer); Northumberland, *P.* 13578 (1912); (Stark); (Milan); (Success); (Berlin); (Dalton); Whitefield, *M.* 4394 (1908), *P.* 16700 (1916); Carroll, Crawford's, *J. M. Greenman* (1898); Jefferson, *P.* 16492 (1917); Randolph, *M.* 4295 (1908), *P.* 12354 (1909); Gorham, *P.* 16107 (1914);

Shelburne, *Deane* (1882, 1884, 1916); Bean Purchase, North Baldface Mt., *P.* 16031 (1914); Thompson & Meserve Purchase, Lowe's Bald Spot, *P.* 17500 (1919).

Viburnum Lentago L. Rare.—Shelburne, *Deane* (1919).

SAMBUCUS [Tourn.] L. Elder.

Sambucus canadensis L. Common Elder. Rich soil, frequent.—(Pittsburg); Dartmouth College Grant, *P.* 16160 (1914); (Stratford); (Stark); (Carroll); (Jefferson); Randolph, *Williams* (1897), *M.* 244 (1902), 4222 (1908), *P.* 12081 (1909); Gorham, *M.* 4223 (1908); Shelburne, *Deane* (1882, 1884); Sargent Purchase, summit of Mt. Washington, *Williams* (1901).

Sambucus racemosa L. Red-berried Elder. Woods and clearings, common.—Pittsburg, Second Lake, *P.* 10343 = *M.* 3422 (1907); Dartmouth College Grant, *P.* 16148 (1914); (Millsfield); (Colebrook); (Columbia); Stratford, *P.* 13490 (1912); (Northumberland); (Milan); (Success); (Berlin); (Lancaster); Carroll, Crawford's, *Williams* (1895); (Jefferson); Randolph, *M.* 1128 (1903), *Mrs. G. F. Moore* (1905), *P.* 11148 (1908), 16445 (1917); Gorham, *Miss S. C. Batchelder* (1883), *M.* 4239 (1908), *Deane* (1916); Shelburne, *Deane* (1882, 1883, 1917); (Bean Purchase); (Low & Burbank Grant); (Thompson & Meserve Purchase).

VALERIANACEAE (VALERIAN FAMILY).

VALERIANA [Tourn.] L. Valerian.

Valeriana officinalis L. Rare garden escape.—Randolph, *P.* 16496 (1917).

CUCURBITACEAE (GOURD FAMILY).

CUCURBITA [Tourn.] L.

Cucurbita Pepo L. Pumpkin. Rare escape.—Jefferson, *P.* 11091 (1907).

ECHINOCYSTIS T. & G. California Cucumber.

Echinocystis lobata (Michx.) T. & G. Dumps and waste rich ground, occasional.—Stewartstown, *P.* 10309 (1907); Lancaster, *P.* 12337 (1909); Whitefield, *P.* 11437 (1908); Randolph, *P.* 12514 (1909); Gorham, *P.* 11094 (1907), *M.* 4283, 4295 (1908); Berlin, *P.* 5701 (1904).

CAMPANULACEAE (BLUEBELL FAMILY).

CAMPANULA [Tourn.] L. Harebell.

Campanula rapunculoides L. Infrequently escaped or persistent.—Stark, *P.* 12860 (1910); Randolph, *Williams* (1897), *M.* 1373 (1903), *P.* 10771 (1907), *M.* 4594 (1909).

Campanula rotundifolia L. Harebell. Cliffs, local; heads of alpine ravines, frequent.—Dartmouth College Grant, Gorge of Diamond River, *P.* 10616 (1907); Stark, Devil's Hop Yard, *P.* 17449 (1919); Berlin, near Jasper Cave, *P.* 14509 (1913); Randolph, Ice Gulch, *P.* 16649 (1917); Shelburne, *Deane* (1883); Thompson & Meserve Purchase, Great Gulf, *W. Boott* (1855), *E. & C. E. Faxon* (1879), *P.* 12881 (1910), Carriage Road, *Deane* (1884); Sargent Purchase, Alpine Garden, *E. & C. E. Faxon* (1885), *Williams* (1893, 1895), *P.* 10550 (1907), Huntington Ravine, *A. C. Sprague* (1914), Tuckerman Ravine, *W. Boott* (1855), *Miss G. M. Sanger* (1886), Lakes of the Clouds, *J. R. Churchill* (1890); Cutts Grant, Oakes Gulf and Mt. Monroe, *Tuckerman* (no date), *E. & C. E. Faxon* (1877, 1882, 1885), *J. A. Allen* (1880), *Williams* (1895, 1896); Mt. Washington, not definitely located, *F. Boott* (1816), *A. Gray* (1842), *W. Boott* (1853), *H. Mann* (1862), *W. P. Rich* (1880); Bean Grant, Mt. Webster, *P.* 11778 (1908); Hadley Grant, Mt. Crawford, *P.* 11733 (1908); Carroll, Crawford's, *Miss S. Minns* (1885).

Campanula aparinoides Pursh. Wet meadows, occasional.—Lancaster, *P.* 12787 (1910); Carroll, *P.* 16815 (1916); Randolph, *P.* 9901 (1906), *M.* 4584 (1909); Gorham, *P.* 16544 (1915); Shelburne, *Deane* (1883, 1914).

Campanula divaricata Michx. Rarely adventive.—Randolph, railroad track west of Appalachia, *P.* 18093 (1920; persistent in 1923).

Campanula punctata Lam. Rarely adventive.—Shelburne, *Deane* (1923).

LOBELIACEAE (LOBELIA FAMILY).

LOBELIA [Plumier] L. Lobelia.

Lobelia spicata Lam. Occasionally adventive in dryish pastures.—Colebrook, *P.* 10378 (1907); Whitefield, *Deane* (1896);

Randolph, *Williams* (1893), *P.* 1277 (1902), *Mrs. G. F. Moore* (1907); Gorham, *P.* 16706 (1916); Shelburne, *Mrs. E. S. Drown* (1916).

Lobelia spicata Lam., var. hirtella Gray. Adventive near railroad tracks, occasional.—Milan, *P.* 13802 (1912); Dalton, Scott Junction, *P.* 12150 (1909); Jefferson, *P.* 12023 (1909); Randolph, *P.* 18076 (1921).

Lobelia Kalmii L. Bogs and seepy slopes in the calcareous district, locally common.—Stewartstown, Ladd Pond, *P.* 10389 = *M.* 3955 (1907), *F. & P.* 17005 (1917); Dixville, meadow near Notch, *W. Boott* (1855); Colebrook, *P.* 13985, 13988 (1912).

Lobelia inflata L. Indian Tobacco. Fields and pastures, common.—Pittsburg, *P.* 11022 (1907); Dartmouth College Grant, *P.* 16145 (1914); (Clarksville); (Columbia); (Millsfield); Milan, *P.* 13814 (1912); (Berlin); (Lancaster); Whitefield, *Deane* (1897), *M.* 4412 (1908); Carroll, *Williams* (1895); (Jefferson); (Low & Burbank Grant); Randolph, *P.* 1280 (1902), *M.* 1377 (1903), 1930 (1904), *Mrs. G. F. Moore* (1907); Gorham, *P.* 16925 (1916); Shelburne, *Deane* (1882, 1883); Martin Location, *P.* 14335 (1913).

Lobelia Dortmanna L. Water Lobelia. Shallow water in ponds, frequent.—Pittsburg, Round Pond, *W. C. Kendall, E. L. Goldsborough, & A. Doolittle* (1904); Dalton, Forest Lake, *P.* 17511 (1919); Whitefield, Burns Pond, *P.* 14560 = *M.* 5050 (1913); Carroll, Ammonoosuc Lake, *anon.* (no date), Saco Lake, *P.* 11738 (1908).

COMPOSITAE (COMPOSITE FAMILY).

EUPATORIUM [Tourn.] L. Thoroughwort.

Eupatorium maculatum L. (*E. purpureum* L., var. *maculatum* (L.) Darl.; *cf. Rhod.* 22 (1920), 64–66). Joe-Pye Weed. Damp ground, common.—Pittsburg, First Lake, *Mrs. A. F. Stevens* (1895), *M.* 3638 (1907); Dartmouth College Grant, *P.* 16194 (1914); Cambridge, *P.* 18151 (1921); (Millsfield); (Columbia); (Stratford); (Northumberland); (Stark); (Success); Whitefield, *Deane* (1896); Carroll, Crawford's, *C. E. Faxon* (1884) flowers white; Randolph, *P.* 11697 (1908), 17920 (1920); (Gorham); Shelburne, *Deane* (1914, 1915).

Eupatorium maculatum L., var. **foliosum** (Fern.) Wieg. (*Rhod.* 22 (1920), 66). Infrequent, mostly in shade.—Pittsburg, *F. & P.* 17068 (1917); Jefferson, *P.* 16836, 16837 (1916); Randolph, Ice Gulch, *P.* 11498 (1908).

Eupatorium perfoliatum L. Boneset. Wet places, occasional, especially southward.—(Dalton); Jefferson, *P.* 14458 (1913), 16884 (1916); Randolph, *Williams* (1896), *P.* 1394 (1902), *M.* 4597 (1909), *P.* 14490 (1913); Shelburne, *Deane* (1919, 1922).

Eupatorium urticaefolium Reichard. Rich damp woods, locally abundant, especially northward.—Pittsburg, near Camel's Rump, *P.* 19117 (1922), near Back Lake, *F. & P.* 16983 (1917); (Clarksville); Stewartstown, *P.* 14020 (1912); Dixville, *E. Faxon* (1872); Millsfield, *P.* 18192 (1921); (Stark); Carroll, *P.* 16577 (1915), Crawford's, *Williams* (1895); Kilkenny, Mt. Pliny, *P.* 11011 (1907); Randolph, Ice Gulch, *J. R. Churchill* (1889), *P.* 1397 (1902); Shelburne, *Miss E. Brackett* (1916); Pinkham Grant, *F. G. Floyd* (1903), *P.* 13920 (1912); Sargent Purchase, Giant's Stairs, *P.* 14045 (1912); Hadley Grant, Hart Ledge, *P.* 16637 (1915).

GRINDELIA Willd. Gum-plant.

Grindelia squarrosa (Pursh) Dunal. Rare waif.—Lancaster, beside grain-shed, *P.* 12820 (1910).

SOLIDAGO L. Golden-rod.

Solidago squarrosa Muhl. Frequent on gravelly banks in the larger river-valleys, and on open ledges on the lower mountains.—Dartmouth College Grant, *P.* 10608 (1907), 16201 (1914); Success, *P.* 11767 = *M.* 4311 (1908); Berlin, *P.* 5418 (1904), *M.* 4511 (1908); Gorham, *T. Morong* (1874), *Deane* (1884), *P.* 11440 (1908); Martin Location, *P.* 10535 (1907), 17222 (1918); Shelburne, *E. Faxon* (1872), *Deane* (1884, 1916); Bean Purchase, Wild River valley, *P.* 16599 (1915); Stewartstown, *P.* 14014 (1912); Stratford, *P.* 17701 (1919); (Lancaster); Dalton, *P.* 14507 = *M.* 4898 (1913); Crawford Purchase, *P.* 11525 (1908); Bean Grant, Mt. Webster, *P.* 11748 (1908); Sargent Purchase, Giant's Stairs, *P.* 14026 (1912); Hadley Grant, Mt. Crawford, *P.* 11728 (1908).

Solidago caesia L. (including vars. *axillaris* (Pursh) Gray and *paniculata* Gray). Deciduous woods, local.—Lancaster, Mt. Orne, *P.* 14522 (1913), Mt. Prospect, *P.* 14574 (1913); Dalton, *P.* 14566 = *M.* 5007 (1913); Shelburne, *Deane* (1914, 1915, 1916); Hadley Grant, Hart Ledge, *P.* 16615 (1915).

Solidago latifolia L. Moist woods, frequent.—Stewartstown, *P.* 13929 (1912); Colebrook, *P.* 13987, 13997 (1912); (Columbia); Millsfield, *P.* 18202 (1921); Stratford, *F.* & *P.* 17027 (1917), *P.* 17670 (1919); (Stark); Success, *P.* 10649 (1907); Lancaster, *P.* 14519 (1913); Whitefield, *P.* 11575 (1908); (Carroll); Jefferson, *P.* 16859 (1916); Randolph, *J. R. Churchill* (1889), *H. J. Williams* (1897), *M.* 336 (1902), *P.* 9923 (1906), *M.* 4453 (1908); Gorham, *P.* 16927 (1916); Shelburne, *C. E. Faxon* (no date), *Deane* (1883, 1913, 1914).

Solidago bicolor L. White Golden-rod; Silver-rod. Dry soil, frequent and locally abundant.—Dartmouth College Grant, *P.* 10619 (1907); (Columbia); (Stratford); Northumberland, *P.* 17252 (1918); (Stark); Milan, *P.* 10539 (1907), 13726 (1912), 17315 (1918); Berlin, *P.* 5424 (1904), *M.* 4507 (1908); Lancaster, *P.* 12273 (1909), 14529 (1913); (Dalton); Carroll, *P.* 16582 (1915); (Jefferson); Randolph, *P.* 10580 (1907); Gorham, *M.* 4288, *P.* 11458 (1908); Shelburne, *Deane* (1883, 1913, 1914); (Bean Purchase); Sargent Purchase, Mt. Resolution, *P.* 14037 (1912).

Solidago bicolor × caesia. Rare.—Shelburne, *Deane* (1915).

Solidago bicolor × hispida. Rare.—Gorham, *P.* 17074 (1917).

Solidago hispida Muhl. Dry open soil, locally common.—Berlin, *P.* 5425 (1904), *M.* 4512 (1908); Gorham, *Deane* (1885), *P.* 10705 (1907), *M.* 4289 (1908), *P.* 17073 (1917); Shelburne, *E. Faxon* (1872), *Deane* (1914, 1916); Dalton, *P.* 14569 (1913).

Solidago macrophylla Pursh. Moist woods, especially in primeval forest, common.—Stewartstown, *F.* & *P.* 16615 (1917); Dixville, *P.* 18146 (1921); (Columbia); (Stark); Milan, *P.* 13927 (1912); (Success); Randolph, *P.* 2542 (1903), 9908 (1906); Shelburne, *Deane* (1917); Bean Purchase, Carter Notch, *M.* 5067 (1913); Green Grant, *Deane* (1882); Low & Burbank Grant, *F.* & *P.* 15573 (1917); Thompson & Meserve Purchase, Great

Gulf, *C. E. Faxon* (1882); Sargent Purchase, Alpine Garden, *C. E. Faxon* (1879), Tuckerman Ravine, *E. D. Merrill* (1896). Boott Spur, *M.* 274 (1902); Mt. Washington, not definitely located, *W. F. Flint & J. H. Huntington* (1876), *E. Faxon* (1882).

Solidago macrophylla Pursh, var. **thyrsoidea** (Mey.) Fern. Moist places in the alpine region, frequent.—Low & Burbank Grant, *P.* 12333 (1909), Nowell Peak, *P.* 12308 (1909); Thompson & Meserve Purchase, *P.* 12837 (1910), Carriage Road, *Williams* (1896), *Miss C. A. Gauthier* (1915); Sargent Purchase, summit of Mt. Washington, *E. Faxon* (1887), *J. R. Churchill* (1890), *Miss C. A. Gauthier* (1915), Alpine Garden, *Oakes* (no date), *Williams* (1893, 1895, 1896, 1901), *B. L. Robinson* (1901), *P.* 10547, 10551 (1907), 12512 (1909).

Solidago Cutleri Fern. Stony and barren soil in the alpine region, common; rarely at lower levels.—Low & Burbank Grant, Durand Ridge, *J. R. Churchill* (1889); Thompson & Meserve Purchase, *P.* 12339 (1909), Madison Huts, *P.* 1473 (1900), Mt. Adams, *W. G. Farlow* (1882), Great Gulf, *E. & C. E. Faxon* (1882), Carriage Road, *Deane* (1882), *Williams* (1896, 1897), *W. W. Eggleston* (1901), *P.* 4098, 5404 (1904), *F. F. Forbes* (1914); Sargent Purchase, Alpine Garden, *E. & C. E. Faxon* (1887, 1893, 1894), *Williams* (1893), *P.* 1476 = *M.* 275 (1902), Crawford Path, *Williams* (1893); Mt. Washington, not definitely located, *F. Boott* (1816), *A. Gray* (1842), *C. E. Faxon* (1877), *J. A. Allen* (1878), *Miss F. C. Prince* (1890), *W. W. Eggleston* (1899); Cutts Grant, Mt. Monroe, *E. & C. E. Faxon* (1885), Oakes Gulf, *E. & C. E. Faxon* (1893); alpine region, not definitely located, *Oakes* (no date), *H. Mann* (1862), *C. G. Pringle* (1877, 1878); Pinkham Grant, roadside near Thompson Falls, *F. W. Grigg* (1914); Shelburne, summit of Shelburne Moriah Mt., *Miss A. W. Christensen & Miss C. A. Gauthier* (1917).

Solidago Randii (Porter) Britton (including var. *monticola* (Porter) Fern.). Open ledges and gravelly soil, especially on the lower mountain summits, frequent.—Kilkenny, Green Ledge, *P.* 13958 (1912); Gorham, ballast, *P.* 16329 (1914), Pine Mt., *P.* 16310 (1914), Mt. Hayes, *P.* 12862 (1910); Shelburne, *C. E. Faxon* (1886), *P.* 11774 (1908), Mt. Cabot, *Deane* (1884), Bald-

cap Peak, *P.* 10791 (1907); (Bean Purchase); Pinkham Grant, Crystal Cascade, *P.* 10793 (1907); Thompson & Meserve Purchase, Carriage Road, *Miss C. A. Gauthier* (1915); Sargent Purchase, Carriage Road, *W. F. Flint & J. H. Huntington* (1876), *P.* 10571 (1907), summit of Mt. Washington, *Miss C. A. Gauthier* (1915), Giant's Stairs, *P.* 14048 (1912); Mt. Washington, not definitely located, *J. Robinson* (1901); Bean Grant, Mt. Webster, *W. P. Rich* (1880), *P.* 11741, 11742, 11746, 11747 (1908); Carroll, Crawford's, *P.* 11739 (1908); Hadley Grant, Mt. Crawford, *P.* 11709, 11753 (1908), Mt. Hope, *P.* 16474 (1915), Hart Ledge, *P.* 16628 (1915).

Solidago puberula Nutt. Sandy soil, rare.—Jefferson, Jefferson Junction, *P.* 16818 (1916); Shelburne, *Deane* (1914).

Solidago arguta Ait. Open woods, occasional.—Lancaster, *P.* 14544 (1913); Jefferson, *P.* 5419, 5667 (1904), 10633 (1907); Randolph, *P.* 13921 (1912); Gorham, *P.* 14061 (1912); Shelburne, *Deane* (1884, 1914, 1916); Sargent Purchase, Mt. Resolution, *P.* 14050 (1912).

Solidago juncea Ait. Dry banks, occasional.—Northumberland, *P.* 12121 (1909); Lancaster, *P.* 12110, 12287 (1909), 16739 (1916); (Jefferson); Berlin, *P.* 5700 (1904); (Gorham); Shelburne, *Deane* (1883, 1913, 1917).

Solidago uniligulata (DC.) Porter. Sphagnum bogs, rare.—Whitefield, Weed Pond, *P.* 14404 (1913).

Solidago rugosa Mill. Pastures and borders of woods, very common.—Pittsburg, First Lake, *Mrs. A. F. Stevens* (1895), near village, *F. & P.* 16996 (1917); (Stewartstown); Colebrook, *P.* 13995 (1912); (Columbia); (Millsfield); (Cambridge); Stratford, *P.* 16561 (1919); Northumberland, *P.* 17263 (1918); (Stark); Milan, *P.* 17318 (1918); (Success); (Berlin); (Kilkenny); (Lancaster); Dalton, *M.* 4375 (1908); Whitefield, *P.* 11563 = *M.* 4424 (1908); (Low & Burbank Grant); Jefferson, *P.* 16856 (1916); Randolph, *H. J. Williams* (1897), *M.* 337 (1902), *P.* 11483 (1908), 17232, 17233, 17235 (1918); Gorham, *P.* 16920 (1916); Shelburne, *Deane* (1884, 1913); Bean Purchase, *M.* 5065 (1913); (Pinkham Grant).

Solidago rugosa Mill., var. **villosa** (Pursh) Fern. Frequent.—Stewartstown, *F.* & *P.* 17003 (1917); Millsfield, *F.* & *P.* 16994 (1917); Wentworth Location, *F.* & *P.* 16992 (1917); Jefferson, *P.* 17340 (1918); Randolph, *P.* 17088 (1917); Pinkham Grant, *P.* 17083 (1917); Sargent Purchase, Carriage Road, *P.* 16305 (1914).

Solidago nemoralis Ait. Dry open soil, common southward.—(Stratford); Northumberland, *P.* 17267 (1918); (Stark); Milan, *P.* 17319 (1918); (Berlin); (Lancaster); Jefferson, *P.* 16842 (1916); Randolph, *P.* 1477, *M.* 338 (1902); Gorham, *P.* 12890 (1910), 16605 (1915); Shelburne, *Deane* (1913).

Solidago canadensis L. Thickets and open soil, very common.—Pittsburg, *Mrs. A. F. Stevens* (1895); Dartmouth College Grant, *P.* 16186 (1914); (Stewartstown); Colebrook, *P.* 13996 (1912); (Columbia); (Millsfield); (Cambridge); Northumberland, *P.* 17253 (1918); (Stark); Milan, *P.* 17317 (1918); (Success); Berlin, *Deane* (1883); (Lancaster); (Dalton); Whitefield, *Deane* (1897), *M.* 4398 (1908); (Carroll); (Low & Burbank Grant); Jefferson, *P.* 16855 (1916); Randolph, *Williams* (1897), *P.* 1464, *M.* 392 (1902), *P.* 11552, 11659, 11660 (1908); Gorham, *P.* 16929 (1916); Shelburne, *Deane* (1883, 1914); (Thompson & Meserve Purchase).

Solidago canadensis × **Randii.** Rare.—Sargent Purchase, Carriage Road near two-mile sign, *J. R. Churchill* (1889).

Solidago serotina Ait. Alluvial thickets, occasional.—Colebrook, *P.* 13991 (1912); (Columbia); Stratford, *P.* 17702 (1919); Northumberland, *P.* 17251 (1918), 19091 (1922); Stark, *P.* 16306 (1914); Lancaster, *P.* 12312 (1909), 14536 (1913); Whitefield, *P.* 11564 = *M.* 4402 (1908); Jefferson, *P.* 17339 (1918); Shelburne, *Deane* (1884).

Solidago serotina Ait., var. **gigantea** (Ait.) Gray. Low grounds, less common.—Jefferson, *P.* 16586 (1915); Randolph, *P.* 13922 (1912); Shelburne, *P.* 11710 (1908).

Solidago graminifolia (L.) Salisb. (including var. *Nuttallii* (Greene) Fern., which is the phase common in our area). Pastures and roadsides, very common.—Clarksville, *P.* 17692 (1919);

Colebrook, *P.* 13992 (1912); (Millsfield); (Errol); (Cambridge); (Stratford); Northumberland, *P.* 17256 (1918); (Stark); Milan, *P.* 13739 (1912), 17316 (1918); Berlin, *P.* 19067 (1922); (Lancaster); Whitefield, *Deane* (1897), *M.* 4420 (1908); (Carroll); (Low & Burbank Grant); Jefferson, *M.* 135 (1901), *P.* 16841 (1916); Randolph, *Williams* (1897), *M.* 1383 (1903), *P.* 11678 (1908), 12277 (1909); Gorham, *P.* 16916 (1916); Shelburne, *Deane* (1883, 1902, 1913, 1914), *M.* 4878 (1911).

BELLIS [Tourn.] L. English Daisy.

Bellis perennis L. Rarely escaping from gardens.—Shelburne, *Deane* (1919).

ASTER [Tourn.] L. Aster.

Aster macrophyllus L. (including various varieties). Moist woods, common.—(Clarksville); Columbia, *P.* 14068 (1912); Milan, *P.* 13734 (1912); Success, *P.* 10648, 10649 (1907); Lancaster, *P.* 14521 (1913); Randolph, *P.* 1332 (1901), 1329, 1333 (1902), 4697, 5408 (1904); Gorham, *Williams* (1895), *P.* 11454 (1908), 12778, 12873 (1910), 14061 (1912); Shelburne, *Deane* (1883, 1885, 1914, 1915); Green Grant, *P.* 13905 (1912); Bean Purchase, Carter Notch, *P.* 4083 (1904).

Aster radula Ait. Bogs and low ground, frequent.—(Cambridge); Milan, *P.* 13728 (1912); Success, *P.* 16287 (1914); Whitefield, *P.* 11571 = *M.* 4420 (1908); Jefferson, *P.* 12781 (1910); Randolph, *P.* 10670 (1907); Gorham, *P.* 14078 (1912), 16322 (1914); Shelburne, *Deane* (1883), *P.* 12201 (1909), *Deane* (1917), Dream Lake, *P.* 19210 (1923).

Aster radula Ait., var. **strictus** (Pursh) Gray. Rare.—Carroll, Crawford's, *E. & C. E. Faxon* (1881, 1889, 1895), *Williams* (1895).

Aster undulatus L. Dry soil, local.—Dalton, *P.* 14568 = *M.* 4897 (1913); Gorham, Cascade village, *P.* 17260 (1918); Shelburne, *Deane* (1913); Hadley Grant, Hart Ledge, *P.* 16620 (1915).

Aster cordifolius L. Woods and roadsides, common.—(Pittsburg); (Stewartstown); Colebrook, *P.* 13999 (1912); (Columbia);

(Errol); (Stratford); Northumberland, *F. & P.* 16974 (1917); (Stark); (Milan); Berlin, *P.* 11643 = *M.* 4514 (1909); Lancaster, *P.* 14515, 14530 (1913), 17622 (1919); Jefferson, *P.* 16858 (1916); Randolph, *P.* 1325, *M.* 395 (1902), *P.* 16299 (1914); Gorham, *P.* 12891 (1910); Shelburne, *Deane* (1884, 1911, 1913, 1914).

Aster Lindleyanus T. & G. Rich woods, rare.—Jefferson, path to Mud Pond, *P.* 17341 (1918).

Aster vimineus Lam. Rare.—Errol, Errol Dam, *F. & P.* 16995 (1917).

Aster lateriflorus (L.) Britton, var. **hirsuticaulis** (Lindl.) Porter. Alluvial woods in the Connecticut valley, local.—Columbia, *P.* 17732 (1919); Dalton, *P.* 18144 (1921).

Aster Tradescanti L. Locally abundant.—Errol, Lake Umbagog, *H. A. Purdie* (1897); Cambridge, Lake Umbagog, *P.* 16567 (1915).

Aster paniculatus Lam. Wet meadows, etc., frequent, especially in the larger valleys.—(Pittsburg); Dartmouth College Grant, *P.* 16157½ (1914); Stewartstown, *P.* 13931 (1912), 17688 (1919), Ladd Pond, *F. & P.* 17055 (1917); Columbia, *P.* 13969 (1912); Stratford, *P.* 17731 (1919); Northumberland, *P.* 17268 (1918); (Stark); Milan, *P.* 14005 (1912); Berlin, *P.* 11766 = *M.* 4305 (1908); Lancaster, *P.* 14533 (1913); Dalton, *P.* 11601 (1908); Jefferson, *P.* 12926 (1910), 16888 (1916); Randolph, *P.* 16571 (1915), 16937 (1916); Gorham, *P.* 10725 (1907); Shelburne, *Deane* (1913); Green Grant, *P.* 12886 (1910).

Aster longifolius Lam. Low ground, rare.—Shelburne, riverbank, *Deane* (1902), Wheeler Bog, *Deane* (1914).

Aster longifolius Lam., var. **villicaulis** Gray. Low ground, rare.—Jefferson, between Cherry Mtn. and Bailey's, *P.* 17353 (1918).

Aster novi-belgii L. Androscoggin valley, local.—Berlin, *P.* 11644 = *M.* 4513 (1908); Randolph, 16320 (1914); Gorham, *P.* 10724 (1907), 11485 (1908); Shelburne, *Deane* (1913, 1916).

Aster foliaceus Lindl. (*Rhod.* 17 (1915), 13–14). Riverbanks, gravelly places, etc., locally at times abundant, especially in the lower part of the Androscoggin valley; also in the alpine and sub-

alpine regions.—Lancaster, *P.* 12789 (1910); Randolph, *P.* 17373 (1919); Berlin, *W. W. Eggleston* (1899); Gorham, *W. W. Eggleston* (1899), *P.* 16500 (1915), 16942 (1916), 17396 (1919); Sargent Purchase, Carriage Road, *P.* 10541 (1907), 12834 (1910) 2500 ft., *F. & P.* 16749 (1917); Thompson & Meserve Purchase, Cape Horn, *B. L. Robinson*, 1005 (1901), Tuckerman Ravine, *E. & C. E. Faxon* (1887), *J. R. Churchill* (1889), *W. W. Eggleston* (1898), *P.* 10746 (1907); Cutts Grant, Oakes Gulf, *E. & C. E. Faxon* (1890, 1893, 1896), *Williams* (1896), *P.* 16574 (1915); Mt. Washington, not definitely located, *Mrs. E. H. Terry* (1898).

Aster tardiflorus L. (probably a hybrid of *A. cordifolius* and *A. puniceus; cf. Rhod.* 19 (1917), 88–90). Frequent, in moist soil.—Stewartstown, *P.* 13936 (1912); Jefferson, *P.* 16869 (1916); Randolph, *P.* 16901, 16941 (1916); Gorham, *P.* 16930, 16931, 16932 (1916), 18231 (1921); Shelburne, *E. Faxon* (1872).

Aster tardiflorus L., var. **vestitus** Fern. (probably a hybrid; see above). Occasional.—Colebrook, *P.* 13887 (1912), 17722 (1919); Errol, *F. & P.* 16981 (1917); Randolph, *P.* 16300 (1914), 17259 (1918); Gorham, *P.* 16892, 16893, 16934 (1916).

Aster puniceus L. Low ground, very common.—Pittsburg, First Lake, *Mrs. A. F. Stevens* (1895); Stewartstown, *P.* 14021 (1912); Colebrook, *P.* 13989 (1912); (Columbia); (Millsfield); (Cambridge); (Stratford); (Northumberland); (Stark); Dummer, *Deane* (1915); (Success); (Berlin); (Lancaster); (Carroll); (Low & Burbank Grant); Jefferson, *P.* 16849 (1916); Randolph, *H. J. Williams* (1897), *M.* 347 (1902), *P.* 9919 (1906), *M.* 4464 (1908), *P.* 16939 (1916); Gorham, *M.* 4294 (1908), *P.* 17326 (1918) rays very short, 18230 (1921); (Shelburne); (Bean Purchase); (Pinkham Grant); Sargent Purchase, Tuckerman Ravine, pinkish flowers, *P.* 19103 (1922).

Aster puniceus L., f. **albiligulatus** Pease & Moore n. f.[1] Infrequent.—Randolph, *P.* 16940 (1916); Gorham, *P.* 17325 (1918).

Aster puniceus L., var. **demissus** Lindl. Infrequent.—Randolph, *H. J. Williams* (1897), *P.* 4110½ (1904), 9896 (1906), *M.* 4461 (1908).

[1] **Aster puniceus** L., f. **albiligulatus** Pease & Moore n. f. Ligulis albis. Rays white.

Aster puniceus L., var. **oligocephalus** Fern. Alpine ravines, etc., frequent.—Thompson & Meserve Purchase, Cape Horn, *B. L. Robinson*, 969, 1006, *Williams* (1901); Sargent Purchase, Tuckerman Ravine, *C. E. Faxon* (1872), *E. D. Merrill* (1896), *P.* 11505 (1908).

Aster umbellatus Mill. Open places, very common.—Pittsburg, First Lake, *Mrs. A. F. Stevens* (1895); Dartmouth College Grant, *P.* 16191 (1914); Stewartstown, *P.* 13933 (1912); (Colebrook); (Columbia); (Millsfield); (Cambridge); (Stratford); Northumberland, *P.* 17254 (1918); (Stark); Milan, *P.* 13696 (1912), 17314 (1918); (Success); (Berlin); (Lancaster); Whitefield, *Deane* (1897), *P.* 11570 = *M.* 4346 (1908); (Carroll); Jefferson, *P.* 16876 (1916); (Low & Burbank Grant); Randolph, *J. R. Churchill* (1889), *Williams* (1897), *M.* 348 (1902), *P.* 11681 (1908); Gorham, *P.* 16914 (1916); Shelburne, *Deane* (1883, 1913); (Bean Purchase); (Pinkham Grant); Sargent Purchase, Tuckerman Ravine, *P.* 11544 (1908); Cutts Grant, Oakes Gulf, *Williams* (1901).

Aster linariifolius L. Rarely adventive on railroad gravel.—Randolph, *P.* 19101 (1922).

Aster acuminatus Michx. Woods and clearings, common.—Pittsburg, First Lake, *Mrs. A. F. Stevens* (1895); Dartmouth College Grant, *P.* 16176 (1914); (Clarksville); (Dixville); (Millsfield); (Cambridge); (Columbia); (Stark); Milan, *P.* 13857 (1912); (Success); (Berlin); (Lancaster); (Dalton); (Carroll); Jefferson, *P.* 16850 (1916); Randolph, *Williams* (1894), *M.* 293 (1902), *P.* 9897 (1906); Gorham, *Williams* (1895), *P.* 16926 (1916); Shelburne, *Deane* (1883, 1914); Bean Purchase, *M.* 5078 (1913); (Pinkham Grant); (Low & Burbank Grant); (Thompson & Meserve Purchase); (Sargent Purchase).—The following specimens represent the frequently appearing monstrous form in which the flowers are turned to tufts of chaffy paleae; Millsfield, *P.* 18201 (1921); Northumberland, *P.* 17244 (1918); Lancaster, *P.* 14520 (1913); Whitefield, *P.* 14572 = *M.* 5032 (1913); Randolph, *Williams* (1896), *P.* 1335 (1900), *M.* 3197 (1906); Gorham, *P.* 18224 (1921); Low & Burbank Grant, *P.* 4701 (1904), 12869 (1910); Thompson & Meserve Purchase, Cape Horn, *Williams* (1901); Sargent Purchase, *P.* 10540 (1907).

Aster nemoralis Ait. Boggy shores of ponds, local.—Milan, Mud Pond, *P.* 13690 (1912); Berlin, Head Pond, *P.* 13849 (1912), 19063 (1922); Shelburne, Dream Lake, *P.* 19215 (1923).

ERIGERON L. Fleabane.

Erigeron pulchellus Michx. Robin's Plantain. Moist banks, frequent, especially southward.—Northumberland, *P.* 13640 (1912); Stark, *P.* 14133 (1913); (Success); Lancaster, *P.* 16376 (1915); Dalton, *P.* 16411 (1915); Crawford Purchase, *P.* 11254 (1908); Jefferson, *M.* 1078 (1903), *P.* 16381 (1915); Randolph, *M.* 985 (1903), 3322 (1907), *P.* 11261 (1908); Gorham, *P.* 16003 (1914); Bean Purchase, Wild River valley, *P.* 16027 (1914).

Erigeron philadelphicus L. Open places, frequent.—Pittsburg, Second Lake, *P.* 10240 (1907), First Lake, *M.* 3558 (1907); Atkinson & Gilmanton Academy Grant, *P.* 12599 (1910); Stratford, *P.* 13466 (1912); (Lancaster); (Dalton); Whitefield, *Deane* (1895); Carroll, Bretton Woods, *E. & C. E. Faxon* (1880), Crawford's, *C. E. Faxon* (1879); (Jefferson); Randolph, *P.* 11280 (1908); Gorham, *Deane* (1882); Shelburne, *Deane* (1881, 1882, 1916).

Erigeron annuus (L.) Pers. Daisy Fleabane. Roadsides, etc., occasional.—Pittsburg, *M.* 3743 (1907); Dummer, *Williams* (1895); Lancaster, *P.* 17618 (1919); (Jefferson); (Low & Burbank Grant); Randolph, *Williams* (1897), *M.* 339 (1902), *P.* 4094 (1904), 10586 (1907).

Erigeron ramosus (Walt.) BSP. Daisy Fleabane. Fields, common.—Pittsburg, west of Indian Stream, *P.* 11065 (1907); Dartmouth College Grant, *P.* 16164 (1914); Stratford, *F. & P.* 16820 (1917); Carroll, Crawford's, *Williams* (1895); Jefferson, *F. & P.* 16818, 16819 (1917); Randolph, *Williams* (1896, 1897), *M.* 246 (1902), *P.* 11222 (1908); Shelburne, *Deane* (1915); Martin Location, *P.* 14311 (1913).

Erigeron ramosus (Walt.) BSP., var. **septentrionalis** Fern. & Wieg. (*Rhod.* 15 (1913), 59–61). Fields, common.—Pittsburg, near Second Lake, *M.* 3647 (1907), First Lake, *P.* 10163 (1907); Colebrook, *P.* 16579, 16710 (1917); Milan, *P.* 13744 (1912);

Carroll, *P.* 17424 (1919); Jefferson, *P.* 16853 (1916); Gorham, *P.* 16647 (1917); Shelburne, *Deane* (1882).

ERIGERON CANADENSIS L. HORSEWEED; BUTTERWEED. Waste ground and fields, common.—(Colebrook); (Columbia); (Stratford); Milan, *P.* 13803 (1912); Success, *M.* 4318 (1908); Berlin, *M.* 4310 (1908), *P.* 16433 (1915); (Lancaster); Dalton, *M.* 4358, 4363 (1908); Whitefield, *P.* 11557 = *M.* 4431 (1908); Jefferson, *P.* 16845 (1916); Randolph, *Williams* (1895), *P.* 11558, *M.* 4454 (1908); Gorham, *M.* 4285 (1908); Shelburne, *M.* 4877 (1911), *Deane* (1915); Green Grant, *M.* 4302 (1908).

ANTENNARIA Gaertn. EVERLASTING; CUDWEED.

Antennaria canadensis Greene. Dry banks, common.—Pittsburg, *P.* 10132 = *M.* 3632, 3538 (1907); (Colebrook); (Columbia); Stratford, *P.* 13533 (1912); Milan, *P.* 13844 (1912); (Success); (Berlin); (Lancaster); Whitefield, *Deane* (1897, 1910); Carroll, Crawford's, *Williams* (1898); (Jefferson); Randolph, *P.* 10025 = *M.* 3301 (1907); (Gorham); Shelburne, *Deane* (1904, 1910, 1914); Martin Location, *P.* 14345 (1913); Sargent Purchase, Carriage Road near two-mile sign, *F. F. Forbes* (1914); Thompson & Meserve Purchase, Carriage Road, 3300 ft., *F. & P.* 16747 (1917).

Antennaria fallax Greene. Open woods, etc., rare.—Dalton, *P.* 16413 (1915); Gorham, *P.* 12724 (1910).

Antennaria occidentalis Greene. Thin woods, rare.—Martin Location, *P.* 12850 (1910). For its occurrence on Mt. Deception in Carroll see *Rhod.* 1 (1899), 152.

Antennaria Brainerdii Fern. Open rocky woods, rare.—Hadley Grant, Mt. Hope, *P.* 16451 (1915).

Antennaria neodioica Greene. Dry banks, etc., common.—Pittsburg, *P.* 10294, 10131 = *M.* 3631 (1907); Columbia, *F. & P.* 16697 (1917); Errol, *P.* 12649 (1910); Stratford, *P.* 13564 (1912), Percy Peaks, *P.* 12730 (1910); Northumberland, Cape Horn, *P.* 16262 (1917); (Stark); Milan, *P.* 13843 (1912); (Success); (Berlin); Lancaster, *P.* 16924 (1917); Carroll, Fabyans, *Williams* (1898); (Jefferson); Randolph, *M.* 964 (1903), *P.* 10010 = *M.* 3267 (1907); Gorham, *M.* 1047 (1903); Shelburne, *Deane* (1903, 1909,

1910); Martin Location, *P.* 14313 (1913); Bean Purchase, North Baldface Mt., *P.* 16033 (1914); Sargent Purchase, Carriage Road near two-mile sign, *F. F. Forbes* (1914); Thompson & Meserve Purchase, Carriage Road, 3300 ft., *F.* & *P.* 16248 (1917); Hadley Grant, Mt. Hope, *P.* 16450 (1915).

Antennaria neglecta Greene. Pastures, etc., occasional.—Whitefield, *Deane* (1897); Shelburne, *Deane* (1909, 1910, 1915).

Antennaria petaloidea Fern. Fields and dry banks, occasional.—Stewartstown, *F.* & *P.* 16897 (1917); Colebrook, *P.* 10472 = *M.* 3892 (1907); Stratford, *P.* 13534 (1912); Milan, *P.* 12633 (1910); Randolph, *P.* 1292 (1902), 12150 (1909); Shelburne, *Deane* (1910).

ANAPHALIS DC. Pearly Everlasting.

Anaphalis margaritacea (L.) B. & H. Dry hills, clearings, etc., common.—Pittsburg, *M.* 3659 (1907); Dartmouth College Grant, *P.* 16188 (1914); (Clarksville); (Stewartstown); (Colebrook); (Columbia); (Millsfield); (Cambridge); (Stratford); (Northumberland); (Stark); Milan, *P.* 17313 (1918); Success, *M.* 4322 (1908); (Berlin); (Kilkenny); (Lancaster); (Dalton); Whitefield, *Deane* (1897), *M.* 4400 (1908); (Carroll); Jefferson, *P.* 16854 (1916); (Low & Burbank Grant); Randolph, *Williams* (1895), *M.* 294 (1902), *P.* 9904 (1906); Gorham, *P.* 16912 (1916); Shelburne, *Deane* (1883); Bean Purchase, *M.* 5056 (1913); (Pinkham Grant); Thompson & Meserve Purchase, Great Gulf, *P.* 12903 (1910), Cape Horn, *Williams* (1897).

Anaphalis margaritacea (L.) B. & H., var. **occidentalis** Greene. Along mountain brooks, occasional.—Low & Burbank Grant, King Ravine, *F.* & *P.* 16848 (1917), Valleyway, 4000 ft., *P.* 14434 (1913); Thompson & Meserve Purchase, Great Gulf, *P.* 12904 (1910); Sargent Purchase, Huntington Ravine, Fan, *P.* 19100 (1922), New River, *P.* 13919 (1912); Pinkham Grant, Glen Ellis Fall, *P.* 17646 (1919).

Anaphalis margaritacea (L.) B. & H., var. **subalpina** Gray. Alpine ravines, etc., infrequent.—Thompson & Meserve Purchase, Madison Ravine, *P.* 17210 (1918); Sargent Purchase, Carriage Road, near two-mile sign, *P.* 17498 (1919), Huntington Ravine, Fan, *F.* & *P.* 16862 (1917).

GNAPHALIUM L. CUDWEED.

Gnaphalium obtusifolium L. (*G. polycephalum* Michx.; *cf. Rhod.* 20 (1918), 71). Local.—Shelburne, *Deane* (1915).

Gnaphalium decurrens Ives. Pastures and clearings, frequent.—Colebrook, *P.* 14051 (1912); Columbia, *P.* 13971 (1912); Stratford, *P.* 17703 (1919); (Stark); Milan, *P.* 10569 (1907), 13840 (1912); Berlin, *P.* 11639 = *M.* 4480 (1908); (Lancaster); Dalton, *P.* 11589 (1908), 12369 (1909); Jefferson, *P.* 12930 (1910), 16867 (1916); Low & Burbank Grant, *P.* 10660 (1907); Randolph, *Miss E. Richards*, *Williams* (1896), *P.* 1405, *M.* 365 (1902); Gorham, *P.* 11477 (1908); Shelburne, *Deane* (1883), *P.* 11626 (1908); Bean Purchase, Wild River valley, *P.* 16600 (1915).

Gnaphalium uliginosum L. Roadsides, gardens, and waste soil, common.—(Pittsburg); (Stewartstown); (Colebrook); (Columbia); (Stratford); Dummer, *Williams* (1895); Milan, *P.* 13774 (1912); (Berlin); Whitefield, *Deane* (1897), *P.* 11574 = *M.* 4405 (1908); Carroll, Crawford's, *Williams* (1895); Jefferson, *P.* 16885 (1916); Randolph, *Williams* (1895), *M.* 1376 (1903), *P.* 11655 (1908); Gorham, *P.* 16924 (1916); Shelburne, *Deane* (1883).

Gnaphalium supinum L. Heads of alpine ravines and exposed alpine slopes, local.—Sargent Purchase, Alpine Garden, *E. & C. E. Faxon* (1896, 1897), *Williams* (1896, 1899), *P.* 1403 = *M.* 276 (1902), Tuckerman Ravine, *W. Boott* (1855), *E. & C. E. Faxon* (1877, 1879, 1881, 1885), *J. A. Allen* (1878), *J. R. Churchill* (1890), *Williams* (1893, 1895), *E. D. Merrill* (1896), *W. W. Eggleston* (1899, 1901), *P.* 1404 (1900), Lakes of the Clouds, *J. R. Churchill* (1890); alpine region, not definitely located, *Oakes* (no date), *Tuckerman* (1858), *C. G. Pringle* (1877, 1879).

GNAPHALIUM SYLVATICUM L. Rarely adventive.—Success, abandoned logging railroad, *P.* 11768 = *M.* 4319 (1908).

INULA L. ELECAMPANE.

INULA HELENIUM L. Infrequently adventive.—Northumberland, *P.* 16477 (1917); (Lancaster); Whitefield, *P.* 11565 = *M.* 4407 (1908); Jefferson, *P.* 14275 (1913); Shelburne, *Deane* (1883).

IVA L.

Iva xanthifolia Nutt. Henyards, etc., rarely adventive.—(Colebrook); Berlin, *P.* 10709 (1907); Jefferson, Cherry Mt. station, *P.* 17737 (1919).

AMBROSIA [Tourn.] L. Ragweed.

Ambrosia trifida L. Great Ragweed. Rarely adventive.—Lancaster, Coös Junction, *P.* 12152 (1909).

Ambrosia artemisiifolia L. Roman Wormwood. Waste ground, frequent.—(Colebrook); (Columbia); (Stark); (Berlin); Whitefield, *P.* 17788 (1919); (Carroll); Jefferson, *P.* 16865 (1916); Randolph, *P.* 1288, *M.* 386 (1902), *P.* 9913 (1906); Gorham, *P.* 11455 (1908), 14185 (1913), 16327 (1914); Shelburne, *Deane* (1915); Green Grant, Glen House, *P.* 19073 (1922); Hadley Grant, Hart Ledge, *P.* 16635 (1915).

Ambrosia psilostachya DC. Railroad tracks, rare.—Berlin, *P.* 11718 = *M.* 4505 (1908).

XANTHIUM [Tourn.] L. Cockle-bur.

Xanthium echinatum Murr. Rare weed.—Gorham, *P.* 10714 (1907).

HELIOPSIS Pers. Ox-eye.

Heliopsis scabra Dunal. Alluvial banks, local.—Pittsburg, west of Indian Stream, *F. & P.* 16963 (1917); Shelburne, *Deane* (1913).

RUDBECKIA L. Cone-flower.

Rudbeckia hirta L. Black-eyed Susan. Fields, frequently adventive.—Dartmouth College Grant, *P.* 16223 (1914); Colebrook, *P.* 10410 = *M.* 3906 (1907); (Columbia); (Stratford); (Northumberland); (Stark); (Dummer); Milan, *P.* 13693 (1912); (Berlin); (Dalton); Whitefield, *Deane* (1896); (Carroll); Jefferson, *P.* 16882 (1916); Randolph, *Williams* (1897), *M.* 236, *P.* 1447 (1902); Shelburne, *Deane* (1882, 1916); Martin Location, *P.* 14255 (1913).

Rudbeckia laciniata L. Golden Glow. Rarely spontaneous.—Shelburne, *Deane* (1918).

HELIANTHUS L. Sunflower.

Helianthus annuus L. Common Sunflower. Waste places, occasionally adventive.—Berlin, *P.* 16516 (1915); Whitefield, *M.* 4352 (1908); Randolph, *P.* 4019 (1904), *M.* 4587 (1909); Shelburne, *Deane* (1917, 1918).

Helianthus subrhomboideus Rydb. Adventive on railroad tracks and in ballast, local.—Berlin, Grand Trunk Railroad, *P.* 11524 (1908), gravel pit, *P.* 17834 (1920); Gorham, Grand Trunk Railroad, *P.* 11470 (1908), 12767 (1910), 16325 (1914), Grand Trunk Railroad south of Cascades village, *P.* 17830 (1920).

Helianthus strumosus L. Alluvial woods, local.—Shelburne, *Deane* (1915).

Helianthus decapetalus L. Alluvial copses, occasional.—Stratford, *F. & P.* 17028 (1917), *P.* 17700 (1919); Lancaster, *P.* 12276 (1909); Jefferson, Bailey's, *P.* 10783 (1907); Carroll, Cherry Mt. Road, *P.* 14363 (1913); Gorham, *P.* 11663 (1908).

BIDENS L. Bur Marigold.

Bidens frondosa L. Waste ground, frequent.—Stratford, *P.* 17663, 17699 (1919); (Stark); Berlin, *M.* 4411 (1908), *P.* 17789 (1919); Jefferson, *P.* 16840 (1916); Randolph, *M.* 1457 (1903), 3196, *P.* 9905 (1906), *M.* 4068 (1907), *P.* 16788 (1916); Shelburne, *Deane* (1883), *M.* 4877a (1911).

Bidens tripartita L. Rarely adventive.—Randolph, *P.* 12909 (1910).

Bidens vulgata Greene. Occasionally adventive.—Jefferson, *P.* 16887 (1916); Randolph, *P.* 6418 = *M.* 1929 (1904), *P.* 11553 (1908), 12908 (1910), 17343, 17346 (1917); Shelburne, *Deane* (1915).

Bidens cernua L. Stick-tight. Margins of ponds, etc., frequent.—Pittsburg, *P.* 17685 (1919); Stewartstown, *P.* 19113, 19114 (1922), Ladd Pond, *P.* 13946, 14019 (1912), *F. & P.* 16999 17001 (1917); Stratford, *P.* 17683 (1919); Berlin, Head Pond, *P.* 17077 (1917), 19070 (1922); Dalton, *M.* 4376 (1908); Jefferson, *P.* 11435 (1908), Mud Pond, *P.* 17377 (1918), Little Cherry Pond, *P.* 12934 (1910); Randolph, *P.* 6406, *Mrs. G. F. Moore*

(1904); Gorham, *P.* 12845 (1910); Shelburne, *Deane* (1915, 1918).

Bidens cernua L., var. **minima** (Huds.) DC. (*Rhod.* 17 (1915), 25). Rare.—Stewartstown, Ladd Pond, *F. & P.* 17081 (1917).

Bidens cernua L., var. **oligodonta** Fern. (*Rhod.* 17 (1915), 25). Rare.—Success, Success Pond, *P.* 10738 (1907).

Bidens cernua L., var. **elliptica** Wiegand (*cf. Rhod.* 24 (1922), 207). Occasional.—Shelburne, *Deane* (1884, 1914, 1915).

GALINSOGA R. & P.

Galinsoga parviflora Cav. (*cf. Rhod.* 22 (1920), 100). Rare.—Colebrook, weed in flower-pot, *P.* 17809 (1920).

GAILLARDIA Foug.

Gaillardia aristata Pursh. Rare garden escape.—Shelburne, *Deane* (1919).

ACHILLEA [Vaill.] L. Yarrow.

Achillea Ptarmica L. Sneezeweed. Rare waif.—Whitefield, station, *P.* 11615 = *M.* 4339 (1908).

Achillea Millefolium L. Yarrow. Fields and open places, common.—Pittsburg, *P.* 10096 = *M.* 3651 (1907); Dartmouth College Grant, *P.* 16173 (1914); (Colebrook); (Columbia); (Millsfield); Stratford, *P.* 13572 (1912); (Stark); (Milan); (Success); (Berlin); (Lancaster); (Dalton); Whitefield, *Deane* (1897), *M.* 4335, 4356 (1908); Carroll, *P.* 14363 (1913); Jefferson, *Mrs. E. H. Terry* (1903); (Low & Burbank Grant); Randolph, *Williams* (1897), *M.* 209, *P.* 1286 (1902), *M.* 975 (1903), *P.* 10066 (1907); Gorham, *P.* 12181 (1909); Shelburne, *Deane* (1882); Martin Location, *P.* 14312 (1913), 17218 (1918); Bean Purchase, *M.* 5054 (1913); Sargent Purchase, summit of Mt. Washington, *Williams* (1895), *Miss C. A. Gauthier* (1915).

Achillea Millefolium L., f. rosea Rand & Redfield. Occasionally persistent or adventive.—Northumberland, *P.* 16061 (1914); Lancaster, Mt. Prospect, *P.* 14233 (1913); Jefferson, *P.* 14393 (1913); Randolph, *P.* 11245 (1908); Shelburne, *Deane* (1914).

Achillea Millefolium L., var. **nigrescens** E. Meyer. Damp ledges, rare at lower levels; local at the heads of alpine ravines.—Dartmouth College Grant, Gorge of Diamond River, *P.* 12608 (1910); Thompson & Meserve Purchase, Carriage Road, *Williams* (1901), *P.* 12836, 12843 (1910), *Miss C. A. Gauthier* (1915); Sargent Purchase, Alpine Garden, *C. E. Faxon* (1885), *M.* 277 (1902), Tuckerman Ravine, *P.* 11503 (1908).

ANTHEMIS [Mich.] L. Chamomile.

Anthemis Cotula L. Mayweed. Barnyards and waste ground, frequent.—(Colebrook); Milan, *P.* 13835 (1912); Berlin, *P.* 11642 = *M.* 4503 (1908); Lancaster, *P.* 12162 (1909); Dalton, *P.* 11592 = *M.* 4440 (1908); Whitefield, *P.* 14589 (1913); Randolph, *Williams* (1896), *M.* 1382 (1903), 4079 (1907), *P.* 11521 (1908); Gorham, *P.* 10772 (1907); Shelburne, *Deane*, *Miss E. Dulin* (1917); Martin Location, *P.* 17213 (1918).

MATRICARIA [Tourn.] L.

Matricaria inodora L. Waste ground, rarely adventive.—Randolph, *P.* 11012 (1907).

Matricaria suaveolens (Pursh) Buchenau. Pineapple-weed. Waste ground, recently becoming frequent.—(Colebrook); Lancaster, *P.* 14545 (1913); Carroll, Twin Mt., *P.* 14471 (1913); Randolph, *M.* 4078, *P.* 10224 (1907), *M.* 4894 (1913); Gorham, *P.* 16324 (1914); (Martin Location).

CHRYSANTHEMUM [Tourn.] L. Ox-eye Daisy.

Chrysanthemum Leucanthemum L., var. pinnatifidum Lecoq & Lamotte. White Daisy. Frequent in meadows, etc.—Pittsburg, First Lake, *P.* 10090 = *M.* 3620 (1907); (Stewartstown); (Stratford); (Stark); Milan, *P.* 12634 (1910); (Success); (Berlin); (Dalton); (Carroll); Jefferson, *Mrs. E. H. Terry* (1903); Randolph, *M.* 247 (1902), *P.* 11137 (1908); (Gorham); Shelburne, *Deane* (1915); Martin Location, *P.* 14301 (1913); Thompson & Meserve Purchase, Carriage Road, *P.* 10556 (1907), Cape Horn, *Williams* (1901, 1903); (Sargent Purchase).

TANACETUM [Tourn.] L. Tansy.

Tanacetum vulgare L. Persistent at old house sites, and occasionally adventive in waste ground.—(Colebrook); Stratford,

P. 13655 (1912); Lancaster, *P.* 12365 (1909); Whitefield, *M.* 4353 (1908); (Success).

Tanacetum vulgare L., var. crispum DC. Similar localities to those of the last.—Stark, *P.* 16301 (1914); Randolph, *P.* 12009 (1909); Gorham, *P.* 16439 (1915); Shelburne, *P.* 1493 (1901).

ARTEMISIA [Tourn.] L. Wormwood.

Artemisia Abrotanum L. Southernwood. Rarely adventive.—Jefferson, *G. B. Wellman* (1908).

Artemisia ludoviciana Nutt. Railroad tracks, local.—Berlin, *P.* 11320 (1908), 12798 (1910), apparently well established in several stations.

Artemisia vulgaris L. Mugwort. Dumps, lumber camps, and waste places, frequently adventive.—Stewartstown, *P.* 10115 = *M.* 3384 (1907); Stratford, *Williams* (1906); Northumberland, *Williams* (1906), *P.* 13841 (1912); (Stark); Success, *P.* 10737 (1907); Berlin, *P.* 5496 (1904), *M.* 4517 (1908); Lancaster, *P.* 12336 (1909); Jefferson, *P.* 16868 (1916); Low & Burbank Grant, *P.* 11429 (1908); Randolph, *P.* 16894 (1916); Gorham, *Williams* (1903), *M.* 1433 (1903), *P.* 10712 (1907), *M.* 4471 (1908).

Artemisia biennis Willd. Railroad tracks, etc., occasional.—Berlin, *P.* 10745 (1907), *M.* 4490 (1908); Gorham, *P.* 11473 (1908), 17637 (1919); Whitefield, *P.* 11614 (1908).

Artemisia annua L. Waste places, rare.—Berlin, *P.* 16440 (1915); Pinkham Grant, site of Darby Field Cottage, *W. W. Eggleston* (1901).

Artemisia Absinthium L. Occasionally adventive in waste places, especially northward.—Pittsburg, First Lake, *Mrs. A. F. Stevens* (1895), *P.* 10452 = *M.* 3723 (1907); Clarksville, *P.* 10427 = *M.* 3701 (1907); Colebrook, *P.* 14052 (1912); Columbia, *F. & P.* 16601 (1917); Jefferson, *P.* 16731 (1917), 17351 (1918).

Artemisia pontica L. Gorham, persistent on site of garden, *M.* 4296.

TUSSILAGO [Tourn.] L. Coltsfoot.

Tussilago Farfara L. Occasionally adventive, especially northward, on wet gravelly or clayey banks.—Pittsburg, First

Lake, *P.* 10292 = *M.* 3554 (1907); (Clarksville); Dartmouth College Grant, *P.* 16214 (1914); Stewartstown, *P.* 13934 (1912); Colebrook, *P.* 10492 = *M.* 3884, *P.* 10870 = *M.* 4010 (1907); Northumberland, *P.* 13639 (1912), 16063 (1914); Milan, *P.* 13848 (1912); Lancaster, *P.* 12124 (1909); Dalton, *P.* 16404 (1915); Crawford Purchase, *P.* 11255 (1908); Jefferson, *P.* 16889 (1916); Gorham, *P.* 9914 (1906).

PETASITES [Tourn.] Hill. SWEET COLTSFOOT.

Petasites palmatus (Ait.) Gray. Damp ground, local.—Colebrook, wet meadow. *F. & P.* 16578 (1917); Success, spring near Success Pond, *P.* 16539 (1917).

ARNICA L.

Arnica mollis Hook. Alpine ravines, locally abundant.—Low & Burbank Grant, King Ravine, *P.* 1307 (1902), 12183 (1909); Thompson & Meserve Purchase, Madison Ravine. *P.* 16495 (1915), Great Gulf, *P.* 12901 (1910); Sargent Purchase, Huntington Ravine, *F. & P.* 16854 (1917), Tuckerman Ravine, *W. Boott* (1855), *E. S. Hoar* (1858), *H. Mann* (1862), *W. H. Manning* (1881), *W. G. Farlow* (1882), *E. & C. E. Faxon* (1872, 1885, 1890, 1895), *J. R. Churchill* (1889), *Williams* (1895), *E. D. Merrill* (1896), *M.* 771 (1901), 295 (1902), *P.* 10734 (1907), *M.* 5090 (1913); Cutts Grant, Oakes Gulf, *E. & C. E. Faxon* (1891), *J. R. Churchill* (1895), *Williams* (1895, 1896), *P.* 16572 (1915); alpine region, not definitely located, *Oakes* (no date), *W. F. Flint & J. H. Huntington* (1876).

Arnica mollis Hook., var. **petiolaris** Fern. Less abundant and perhaps not a distinct variety; found also at one station at a lower level.—Shelburne, *Deane* (1884, 1918); Low & Burbank Grant, King Ravine, *P.* 1306 (1901); Sargent Purchase, Huntington Ravine, *P.* 13896 (1912), Raymond Cataract, *P.* 13913 (1912), Tuckerman Ravine, *E. Faxon* (1885), *P.* 1304 (1898).

ERECHTITES Raf. FIREWEED.

ERECHTITES HIERACIFOLIA (L.) Raf. (*Rhod.* 19 (1917), 27). Rare.—Success, *M.* 4323 (1908); Shelburne, *P.* 11620 (1908).

ERECHTITES HIERACIFOLIA (L.) Raf., var. INTERMEDIA Fern.

Burned or waste grounds, occasional.—Pittsburg, logging camp southwest of Camel's Rump Mt., *P.* 19142 (1922); Stewartstown, *P.* 19112 (1922); Jefferson, *P.* 16844 (1916); Randolph, *P.* 12868 (1910), 17344 (1918); Gorham, *P.* 12866 (1910); Success, *P.* 12863 (1910); Green Grant, *M.* 1488 (1903).

SENECIO [Tourn.] L. RAGWORT.

SENECIO VULGARIS L. COMMON GROUNDSEL. Infrequently adventive in gardens.—Randolph, *P.* 16675 (1916); Shelburne, *Deane* (1916).

Senecio aureus L. GOLDEN RAGWORT. Boggy meadows, rare.—Pittsburg, between First and Second Lakes, *P.* 10316 = *M.* 3523 (1907).

Senecio Robbinsii Oakes. Wet meadows, etc., common.—Pittsburg, First Lake, *P.* 10151, *M.* 3653 (1907); Dix Grant, *P.* 16135 (1914); (Clarksville); (Stewartstown); Colebrook, *F. & P.* 16581 (1917); (Columbia); (Cambridge); (Stratford); (Northumberland); Milan, *P.* 13732 (1912); (Success); (Berlin); (Lancaster); Dalton, *P.* 16414 (1915); Whitefield, *Deane* (1895, 1896); (Carroll); Jefferson, *M.* 948 (1903), *P.* 16490 (1917); Randolph, *Williams* (1897), *M.* 980 (1903), 3187 (1906), *P.* 10696 (1907); Low & Burbank Grant, King Ravine, *P.* 1453 (1902); Gorham, *M.* 4227 (1908); Shelburne, *Deane* (1903, 1909); Martin Location, *P.* 14339 (1913); Thompson & Meserve Purchase, Carriage Road, 3500 ft., *F. & P.* 16883 (1917); (Sargent Purchase).

Senecio pauperculus Michx., var. **Balsamitae** (Muhl.) Fern. (*S. Balsamitae* Muhl., var. *pauperculus* (Michx.) Fern.; *cf. Rhod.* 23 (1921), 299). Very rare.—Errol, rocky shore of Lake Umbagog, *P.* 10506 (1907).

CALENDULA L.

CALENDULA OFFICINALIS L. Rare garden escape.—Jefferson, *P.* 11103 (1907).

ARCTIUM L. BURDOCK.

ARCTIUM LAPPA L. (*Rhod.* 12 (1910), 44–45). Rarely adventive.—Pittsburg, *P.* 17687 (1919).

ARCTIUM MINUS (Hill) Bernh. (*Rhod.* 12 (1910), 47). Dumps,

etc., occasional.—Lancaster, *P.* 12311 (1909); Dalton, *M.* 4896 (1913); Jefferson, *P.* 10809 (1907); Randolph, *M.* 349 (1902), 4073 (1907), *P.* 11532 (1908), 16914 (1917).

Arctium minus Bernh., var. corymbosum Wieg. (*Rhod.* 26 (1924), 5). Rarely adventive.—Shelburne, *Deane* (1916).

CIRSIUM [Tourn.] Hill. Thistle.

Cirsium lanceolatum (L.) Hill. Bull Thistle. Pastures, etc., occasional.—(Stewartstown); (Stark); Milan, *P.* 13703 (1912); (Berlin); (Lancaster); (Carroll); (Jefferson); Randolph, *M.* 270, *P.* 1384 (1902); Shelburne, *Deane* (1883, 1914); (Martin Location).

Cirsium Muticum Michx. Swamp Thistle. Low ground, frequent, especially northward.—Pittsburg, Indian Stream, *P.* 11067 (1907); Dartmouth College Grant, *P.* 16192 (1914); (Cambridge); Dixville, *W. Boott* (1855); (Stewartstown); Colebrook, *M.* 3908 (1907); (Columbia); Milan, *P.* 13704 (1912); (Success); (Berlin); Lancaster, *Deane* (1896); Carroll, *P.* 14435 (1913), Crawford's, *Williams* (1895); (Jefferson); (Low & Burbank Grant); Randolph, *P.* 12074 (1909).

Cirsium arvense (L.) Scop. Canada Thistle. Pastures, adventive and common.—(Pittsburg); (Clarksville); (Stewartstown); (Columbia); (Millsfield); (Stratford); (Stark); (Milan); (Success); (Berlin); (Lancaster); Whitefield, *Deane* (1897), *M.* 4355 (1908); (Carroll); Jefferson, *M.* 136 (1901); Randolph, *Williams* (1896), *P.* 12059 (1909); Gorham, *M.* 4281 (1908); Shelburne, *Deane* (1883).

Cirsium arvense (L.) Scop., f. albiflorum (Rand & Redfield) R. Hoffmann (*Proc. Boston Soc. Nat. Hist.* 36 (1922), 340). Pastures, infrequent.—Whitefield, *P.* 14573 (1913); (Jefferson); Berlin, *P.* 16520 (1915).

Cirsium arvense (L.) Scop., var. integrifolium Wimm. & Grab. Barnyard, rare.—Randolph, *P.* 19197 (1923).

CENTAUREA L.

Centaurea Cyanus L. Bachelor's Button. Waste places, occasionally adventive.—Randolph, *P.* 10826 (1907), 11623 (1908); Shelburne, *Deane* (1917, 1920).

ARNOSERIS Gaertn.

Arnoseris minima (L.) Link. Rarely adventive in grassland.—Randolph, *P.* 16910 (1917).

CICHORIUM [Tourn.] L. Chicory.

Cichorium Intybus L. (including var. *divaricatum* of Amauth.). Occasionally adventive.—Berlin, *P.* 11631 (1908); Gorham, *P.* 11757 (1908); Shelburne, *Deane* (1918); Green Grant, *P.* 10534 (1907), *M.* 4299 (1908), *P.* 13907 (1912).

HYPOCHAERIS [Vaill.] L. Cat's-ear.

Hypochaeris radicata L. Rarely adventive in grass seed.—Randolph, *P.* 17369 (1919).

LEONTODON L. Fall Dandelion.

Leontodon autumnalis L. Rarely adventive.—Gorham, near canal, *P.* 16921 (1916).

TRAGOPOGON [Tourn.] L.

Tragopogon porrifolius L. Salsify; Oyster Plant. Rarely adventive.—Pittsburg, west of Indian Stream, *P.* 10411 (1907).

TARAXACUM [Haller] Ludwig. Dandelion.

Taraxacum officinale Weber. Common weed.—Pittsburg, Third Lake, *P.* 10154 = *M.* 3487 (1907); Dartmouth College Grant, *P.* 12610 (1910), 16213 (1914); Stratford, *P.* 13638 (1912); (Northumberland); (Stark); Milan, *P.* 13711 (1912); (Success); (Berlin); (Lancaster); Whitefield, *Deane* (1897); (Jefferson); Randolph, *P.* 5405 (1904), *M.* 3377, 3378 (1907); (Gorham); Low & Burbank Grant, Madison Huts, *M.* 1099 (1903); Sargent Purchase, summit of Mt. Washington, *Williams* (1895); Huntington Ravine, *F.* & *P.* 16875 (1917).

Taraxacum ceratophorum (Ledeb.) DC. (*Rhod.* 19 (1917), 111–112). Gullies in alpine ravines, very rare.—Low & Burbank Grant, gully in King Ravine, *P.* 12154 (1909). The first New England station for this species.

Taraxacum laevigatum (Willd.) DC. (as T. *erythrospermum* Andrz. in *Manual*). Pastures, etc., commonly adventive.—Strat-

ford, *P.* 13566 (1912); Milan, *P.* 13773 (1912); (Whitefield); (Jefferson); Randolph, *M.* 1485 (1903); Gorham, *P.* 16923 (1916); Shelburne, *Deane* (1910).

SONCHUS [Tourn.] L. Sow Thistle.

Sonchus arvensis L. Occasionally adventive in waste ground.—Stewartstown, *P.* 14017 (1912); Lancaster, *P.* 12312 (1909); Berlin, *P.* 10835 (1907), *M.* 4306 (1908); Gorham, *P.* 11622 = *M.* 4328 (1908).

Sonchus oleraceus L. Garden weed, etc., occasional.—(Colebrook); Lancaster, *Deane* (1896); (Jefferson); Berlin, *P.* 11717 = *M.* 4485, 4501, 4510 (1908); Gorham, *Deane* (1914).

Sonchus asper (L.) Hill. Waste places, occasional.—Randolph, *M.* 372 (1902), *P.* 18079 (1920); Berlin, *P.* 5698 (1904); Gorham, *P.* 11461 (1908), *Deane* (1914); Shelburne, *Deane* (1918).

Sonchus asper (L.) Hill, var. inermis Bischoff. Waste places.—Lancaster, dump, *P.* 12348 (1909); Whitefield, railroad station, *P.* 11559 (1908).

LACTUCA [Tourn.] L. Lettuce.

Lactuca canadensis L. Roadsides, clearings, etc., common.—Colebrook, *P.* 10866 = *M.* 3942, 3953 (1907); (Stratford); (Stark); Milan, *P.* 13824 (1912); (Berlin); (Gorham); Shelburne, *Deane* (1883); Randolph, *Williams* (1896), *P.* 12105 (1909), 12765 (1910); Jefferson, *P.* 17582 (1919); Carroll, *P.* 17460 (1919).

Lactuca canadensis L., var. **integrifolia** (Bigel.) Gray. Similar places, occasional.—Whitefield, *P.* 14323 (1913); Randolph, *Williams* (1896), *P.* 1429 (1902), *M.* 1374 (1903); Gorham, *P.* 16632 (1915).

Lactuca canadensis L., var. **integrifolia** (Bigel.) Gray, f. **angustata** Wieg. Occasional.—Milan, *P.* 14006 (1912).

Lactuca canadensis L., var. **latifolia** Kuntze. Occasional.—Randolph, *P.* 12765 (1910), 14057 (1912); Carroll, *P.* 17460 (1919).

Lactuca canadensis L., var. **latifolia** Kuntze, f. **exauriculata** Wieg. Rarer.—Dartmouth College Grant, *P.* 16172 (1914).

Lactuca spicata (Lam.) Hitchc. Low grounds, common.—(Pittsburg); (Columbia); (Stratford); (Stark); (Success); (Berlin); Lancaster, *P.* 17642 (1919); (Dalton); Whitefield, *Deane* (1897), *M.* 5074 (1913); (Carroll); (Low & Burbank Grant); Jefferson, *P.* 14432 (1913), 16833 (1916); Randolph, *J. R. Churchill* (1889), *Williams* (1896), *P.* 1430 (1901), *M.* 340 (1902); (Gorham); Shelburne, *Deane* (1882, 1883); (Bean Purchase); (Green Grant); (Pinkham Grant); (Sargent Purchase).

CREPIS L. Hawk's Beard.

Crepis capillaris (L.) Wallr. Locally abundant.—Stewartstown, valley of Bishop Brook, *P.* 17697 (1919).

PRENANTHES [Vaill.] L. Lion's Foot.

Prenanthes trifoliolata (Cass.) Fern. Occasional.—Shelburne, *Deane* (1883, 1884, 1913, 1914); Randolph, *Williams* (1896); Carroll, Crawford's, *Williams* (1895).

Prenanthes nana (Bigel.) Torr. Alpine regions, common.—Low & Burbank Grant, Durand Ridge, *J. R. Churchill* (1889), Nowell Ridge, *P.* 12317 (1909); Thompson & Meserve Purchase, Mt. Adams, *W. G. Farlow* (no date), Mt. Clay, *P.* 1441 (1902), Carriage Road, *Deane* (1884), Cape Horn, *E. Faxon* (1893), *Williams* (1896, 1901); Sargent Purchase, Alpine Garden, *E. & C. E. Faxon* (1879, 1890, 1896), *Williams* (1901), Tuckerman Ravine, *J. A. Allen* (1878), *E. & C. E. Faxon* (1885, 1890), *Williams* (1893), *W. W. Eggleston* (1901), Lakes of the Clouds, *Williams* (1901), Mt. Pleasant, *E. & C. E. Faxon* (1885); Cutts Grant, Oakes Gulf, *Williams* (1896), Crawford Path, *W. Boott* (1853); Hadley Grant, Mt. Crawford, *P.* 11729 (1908); alpine region, not definitely located, *A. Gray* (1842), *W. F. Flint & J. H. Huntington* (1876), *C. G. Pringle* (1877), *W. P. Rich* (1880), *W. G. Farlow* (1884).

Prenanthes altissima L. Moist woods, common.—(Millsfield); (Cambridge); (Success); Lancaster, *P.* 14549 (1913); Whitefield, *Deane* (1897); (Carroll); (Low & Burbank Grant); Jefferson, *P.* 16848 (1916); Randolph, *J. R. Churchill* (1889), *Williams* (1896), *M.* 3207, *P.* 9908 (1906), 10567 (1907); Gorham, *P.* 16911 (1916); (Shelburne); Green Grant, *P.* 13908 (1912); (Pinkham Grant);

(Thompson & Meserve Purchase); Sargent Purchase, Tuckerman Ravine, *Williams* (1895); Cutts Grant, Oakes Gulf, *Williams* (1896).

Prenanthes altissima L., f. **hispidula** Fern. (*Rhod.* 23 (1921), 300). Less frequent.—Lancaster, *P.* 14548 (1913); Randolph, *P.* 14451 (1913); Shelburne, *Deane* (1918).

Prenanthes Boottii (DC.) Gray. Alpine regions, common.—Low & Burbank Grant, above King Ravine, *W. G. Farlow* (1882); Thompson & Meserve Purchase, Great Gulf, *W. Boott* (1855), *Williams* (1893), *W. W. Eggleston* (1898), Carriage Road, *Deane* (1884); Sargent Purchase, summit of Mt. Washington, *Williams* (1901), Alpine Garden, *E. & C. E. Faxon* (1885, 1889, 1890), *Williams* (1893, 1896), *P.* 1444 = *M.* 278 (1902), Tuckerman Ravine, *C. E. Faxon* (1886), *E. D. Merrill* (1896); Cutts Grant, Mt. Monroe, *W. Boott* (1865); alpine region, not definitely located, *Oakes* (no date), *A. Gray* (1842), *H. Mann* (1862), *C. G. Pringle* (1877), *J. A. Allen* (1878), *W. P. Rich* (1880), *W. G. Farlow* (1884), *J. R. Churchill* (1890).

HIERACIUM [Tourn.] L. Hawkweed.

Hieracium aurantiacum L. Devil's Paint-brush. A ubiquitous weed, ruining many farms.—Pittsburg, First Lake, *P.* 10111 = *M.* 3662 (1907); (Stewartstown); Colebrook, *P.* 13975 (1912); (Columbia); (Millsfield); Errol, *Williams* (1903); (Cambridge); (Dummer); (Northumberland); Milan, *P.* 13710 (1912); (Success); (Berlin); (Lancaster); (Dalton); Whitefield, *M.* 5042 (1913); Carroll, *P.* 14440 (1913); (Low & Burbank Grant); (Jefferson); Randolph, *M.* 1091 (1903), *P.* 9902 (1906); Gorham, *M.* 4232 (1908); Shelburne, *Deane* (1914); Martin Location, *P.* 14281 (1913); Sargent Purchase, Mt. Pleasant, 4200 ft., *P.* 16768 (1916).

Hieracium florentinum All. King Devil. Sparingly adventive.—Stratford, *F. & P.* 16613 (1917); Dalton, Dalton Mt., *P.* 16420 (1915); Carroll, near Crawford's, *P.* 16645 (1916).

Hieracium paniculatum L. Rocky woods, frequent southward.—Stark, *P.* 17021 (1917); Lancaster, Mt. Orne, *P.* 14551 (1913); Randolph, *P.* 11736 (1908); Gorham, *P.* 11442 (1908);

Shelburne, *Deane* (1883), *P.* 11692 (1908), *Deane* (1916); Sargent Purchase, Carriage Road, *P.* 13900 (1912); Hadley Grant, Mt. Crawford, *P.* 11735 (1908).

Hieracium scabrum Michx. Dry woods and pastures, common.—Pittsburg, First Lake, *Mrs. A. F. Stevens* (1895); (Colebrook); (Millsfield); (Stratford); (Stark); Milan, *P.* 13799 (1912); (Success); (Berlin); Whitefield, *Deane* (1897); Jefferson, *P.* 16857 (1916); Randolph, *Williams* (1895), *M.* 296 (1902), 1477 (1903), *P.* 11658 (1908), *M.* 4859 (1910); Gorham, *M.* 4275 (1908), *P.* 16861 (1916); Shelburne, *Deane* (1883, 1885); (Thompson & Meserve Purchase); (Sargent Purchase).

Hieracium smolandicum Almq. (*H. vulgatum Man.*, in part). Rocky shores, rare.—Dartmouth College Grant, Gorge of the Diamond River, *P.* 10513 (1907).

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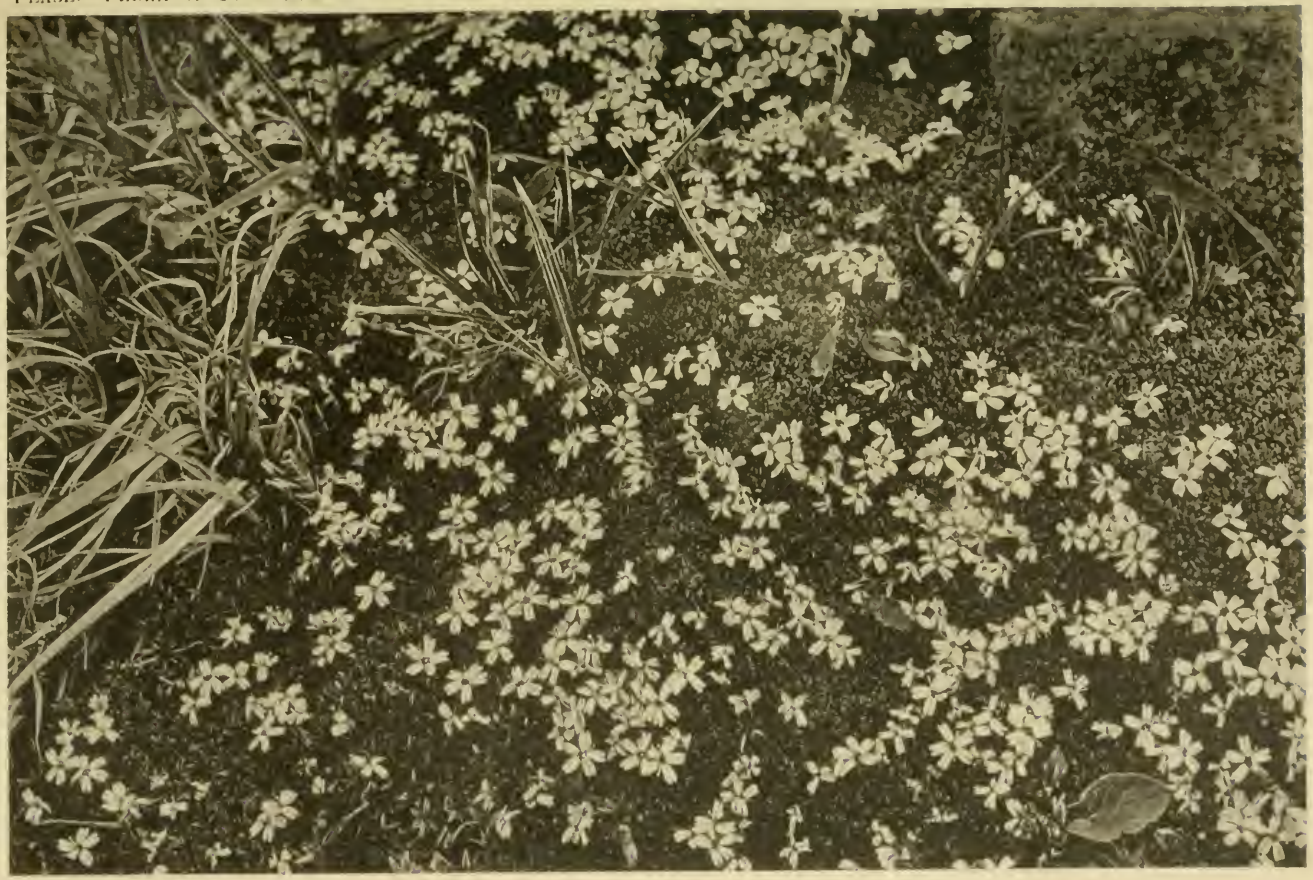

HELIOTYPE CO. BOSTON

PLATE 6.

Cassiope hypnoides (L.) D. Don.

HELIOTYPE CO BOSTON

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HELIOTYPE CO BOSTON

PLATE 8.

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HELIOTYPE CO BOSTON

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HELIOTYPE CO. BOSTON

PLATE 10.

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HELIOTYPE CO. BOSTON

PLATE 11.

Arnica mollis Hook. Tuckerman Ravine, foot of head-wall, Mt. Washington.

HELIOTYPE CO. BOSTON

No. 4.—NEW UPPER CAMBRIAN AND LOWER ORDOVICIAN TRILOBITES FROM VERMONT.

BY PERCY E. RAYMOND.

Introduction.

The northwestern portion of Vermont has attracted the attention of scientific men for nearly a century. It has been the common ground of geologists and palaeontologists from Canada and the United States, and such familiar names as Logan, Billings, Hall, Marcou, and Walcott at once leap to mind when one thinks of this classic region. Needless to say, the structure of the area is not simple, and many diverse views have been held by the successive generations of geologists who have worked there.

Keith (1923) has at last, by careful areal mapping, been able to establish definitely the sequence of formations, and to locate the thrust faults which cause so much trouble. In the course of his work, he was constantly searching for fossils, and at his request, Professor Charles Schuchert accompanied him a part of the time. Lower Cambrian fossils have of course long been known from this region, and scattered references have been made to the presence of species of Upper Cambrian age. The most important discovery was made by Keith when studying the gorge at Highgate Falls, Vermont, in company with Professor Schuchert, Mr. R. W. Sayles, and Dr. Swinnerton. An abundance of Upper Cambrian fossils was then found near the top of what Keith has named the Milton formation, in thinly bedded limestone associated with limestone conglomerates. In the following pages, the writer describes 45 species from this locality, 36 of which are new. The equivalent beds have not yet been found in place elsewhere.

The Milton is overlain at Highgate Falls by the thinly bedded limestone and shale of the Highgate formation, which is more or less well exposed at a number of places in the vicinity of Highgate Center. Because of the pressure which it has undergone, the Highgate has developed in it a schistosity which makes the collection of fossils very difficult. The present indications are that

its fauna is limited in variety. The Georgia rests upon the Highgate, and although largely a slate, contains some limestone in which fossils are abundant, although distorted and very fragmentary. Brachiopods are much more common than trilobites at that horizon. A brief discussion of the faunas and their probable ages will be found in the summary at the end of the paper.

The greater part of the fossils here described were collected by Professor Schuchert, who visited these localities twice in 1922 and again in 1923. On the second trip in 1922 he was accompanied by Professor C. O. Dunbar, who made a part of the collection. At Professor Schuchert's request, the writer studied the trilobites during the winter of 1922–23, at which time nearly all of this paper was written, and in the summer of 1923, he visited all the localities and made additional collections.

Most of the types of the species described are in the Yale University Museum, but representative collections have been deposited in the Museum of Comparative Zoölogy, and the Museum of the Boston Society of Natural History. The figures for the plates were drawn by Dr. Elvira Wood, with the exception of figures 1, 2, 3, 4, 10, 16, 20 and 23, Plate 12; figures 10 and 12, Plate 13; and 4 and 20, Plate 14, which were done by Miss Krause of New Haven.

Order HYPOPARIA Beecher.

Family AGNOSTIDAE McCoy.

Subfamily *Agnostinae* Jaekel.

Agnostus innocens Clark.

Pl. 12, figs. 1, 5.

Agnostus innocens CLARK, Canadian Field-Naturalist, vol. 37, p. 121, pl. 1, figs. 7, 7a, 1923.

Description.—Cephalon (pygidium of modern authors) small, strongly convex, with narrow, flattened but still slightly convex border. Glabella wide, roughly parallel-sided, semicircular in outline at the front. It is crossed by two straight furrows, the anterior of which is at about the mid-length. The frontal lobe is as broad as long, gently and evenly convex. Both the posterior segments of the glabella are crossed by a pair of longitudinal

furrows which break each into three nodes, the outer ones wider than the median one. The central node of the median segment rises into an elongate, ridge-like tubercle, whereas the others are low, smooth mounds. The pleural lobes are smooth. On either side of the margin there is a scarcely perceptible scale-like spine.

Pygidium of small size, strongly convex, with a narrow, flat border. Axial lobe wide at the anterior margin where the accessory lobes cause a sudden expansion; it tapers backward rather gradually behind these lobes. Two cross-furrows divide the axial lobe into three unequal parts. The anterior one is a high, nearly hemispherical mound, surmounted by a small tubercle. The median portion is short, depressed, flat on top, and produces a marked depression in the middle of the axial lobe. The hindermost part is ovoid, almost pointed behind, moderately convex, smooth. The dorsal furrows unite in a median furrow back of the axial lobe as usual in the genus, but this furrow is nearly filled by a low ridge.

Measurements.—Length of cephalon (plesiotype) 4 mm., width 4 mm.; length of glabella 3.5 mm.; width of frontal lobe 2 mm., length 2 mm. Length of pygidium (plesiotype) 6 mm., width 5 mm. (specimens somewhat compressed); length of axial lobe 4.5 mm.; width at accessory lobes 2.5 mm., at middle of posterior lobe 1.75 mm. Other individuals are smaller. The largest cephalon is 6 mm. long.

Comparisons.—As here described, the usual identification of cephalon and pygidium is reversed, although such a procedure cannot yet be fully justified. There is no other described American species of this type, and I have found no European species more like it than *Agnostus trisectus* Salter. That has the same subdivision of the posterior part of the glabella into six small lobes, but the frontal lobe is also trisected, and the cheeks are striated. The two species are probably not closely related.

Horizon and locality.—Both cephala and pygidia are common in zone 3 of the Milton, and are associated for that reason. Clark described the species from specimens obtained in a boulder in the conglomerate at Lévis.

Holotype and paratype in the Museum of Comparative Zoölogy. Plesiotypes here figured are in Yale University Museum.

Agnostus trisectus Salter.

Pl. 12, fig. 3.

Agnostus trisectus Salter, Mem. Geol. Surv., Brit. Org. Rem., dec. 11, pt. 1, p. 10, pl. 1, fig. 11, 1864.—Belt, Geol. Mag., dec. 1, vol. 5, p. 11, 1868.—Linnarsson, Sveriges Geol. Undersokning, ser. C, no. 43, p. 157, pl. 6, fig. 16, 1880.—Tullberg, Sveriges Geol. Undersokning, ser. C, no. 42, p. 24, pl. 1, fig. 13 a, b, 1880.—Matthew, Trans. Roy. Soc. Canada, vol. 11, sect. 4, p. 110, 1893.—Lake, Brit. Camb. Tril., p. 10, pl. 1, fig. 15, 1906.—Westergard, Sveriges Geol. Undersokning, ser. Ca, no. 18, p. 117, pl. 1, figs. 11, 12, 1922.

Agnostus princeps var. *ornatus* Salter, Mem. Geol. Surv., Brit. Org. Rem., dec. 11, p. 4, pl. 1, figs. 4, 5, 1864.

? Agnostus trisectus mut. *ponepunctus* Matthew, Bull. Nat. Hist. Soc. New Brunswick, vol. 4, p. 278, pl. 5, fig. 8a–c, 1901; Rept. Camb. Rocks of Cape Breton, Geol. Surv. Canada, 1903, p. 220, pl. 17, fig. 8a–c.

A single cephalon (pygidium) of this species was found by the writer in 1923. It is somewhat damaged on one side, but shows the characteristic ornamentation, and the peculiar tripartite longitudinal division of the entire axial lobe. The occurrence of the species in this fauna is of particular interest since it has been found to be characteristic of the Peltura zone on Cape Breton, in Great Britain, and in Sweden. Specimens from these widely separated regions show some differences, which may be found to be of specific value. Salter's figured specimen and that from Vermont show two continuous transverse furrows across the glabella, whereas on figured Swedish examples the posterior of these is interrupted by the median pustule. Lake states that both conditions obtain among British specimens. The somewhat obscure ornamentation of the specimens from Cape Breton may justify Matthew's varietal name.

Agnostus americanus Billings appears to be closely related to *Agnostus trisectus*, but has the anterior lobe of the glabella incompletely subdivided. The posterior trans-axial furrow does not cross the median tubercle, and the radial grooves on the cheeks are less deeply impressed than in European specimens of *Agnostus trisectus*.

Measurements.—The length of the cephalon of *Agnostus trisectus* from the Milton is 3 mm., the greatest width about the same.

Horizon and locality.—From the main zone of the Milton at Highgate Falls, Vermont. Figured specimen in the Museum of Comparative Zoölogy.

Agnostus insuetus, sp. nov.

Pl. 12, figs. 2, 6.

Description.—Cephalon somewhat quadrangular, wider than long, with a wide, convex border from which project a pair of short antero-lateral spines. Glabella large, vaulted, and extending nearly to the anterior border. It is roughly rectangular, but the sides are somewhat concave. There are two pairs of glabellar furrows, the hinder ones narrow, directed diagonally inward, almost isolating the basal lobes. The second furrows are faint, and run directly inward on the sides of the middle of the glabella. An oval scar on the summit of the posterior third of the glabella indicates that a rather large median pustule was present. Fixed cheeks low, narrow, and connected around the front of the glabella by an extremely narrow ridge. On the left cheek is what has the appearance of a vestigial facial suture. Starting in the middle of the anterior margin, it runs back in a gentle curve to the dorsal furrow, keeping just outside it to a point opposite the middle of the glabella. Thence it turns diagonally outward and backward toward the genal angle. The other cheek shows the anterior part of the suture quite clearly, but the posterior part is obscure. The sutures meet in a "∧" (*en ogive*) at the front. Pygidium small, about as long as wide, very highly convex, and with a narrow flattened rim. Axial lobe highly convex, with small accessory lobes. It is crossed by one transverse furrow, which divides it into two segments, the anterior twice as long as the other, and bearing on its summit a small conical tubercle. The dorsal furrows meet behind the axial lobe, but there is only the merest trace of such a median longitudinal furrow as is usually found on the pygidium in this genus.

Measurements.—Length of cephlon 2 mm., width 2.5 mm.; length of glabella 1.75 mm., width at back 1.5 mm., at front 1.25 mm.; length of pygidium 1.5 mm., width 1.75 mm.; length of axial lobe 1 mm., width of anterior segment 0.75 mm.

Comparisons.—This species is apparently closely allied to *Agnostus pisiformis obesus* Belt, or at least some of the species which pass under that name. Among specimens referred to that variety there are some with vestiges of a median furrow back of the axial lobe of the pygidium, and some with no trace of it. The

present species differs from the British and Scandinavian specimens of *Agnostus obesus* (Lake, 1906, pl. 1, figs. 13, 14; Westergard, 1922, pl. 1, fig. 4–6) in having weaker second glabellar furrows and the median pustule farther back on the glabella. The presence of what appears to be a suture on this specimen, if the line is not accidental, is of great importance. It shows, first, that what has in the past been called by most writers the pygidium is really the cephalon, and secondly, a fact of wider interest, that the Agnostidae are, as many writers have suggested, really degenerate trilobites which have secondarily achieved blindness. The suture is not close to the margin, as one would expect in a primitive trilobite in which the free cheeks were just appearing on the margin, but on the other hand, as close to the dorsal furrows as possible.

Horizon and locality.—This is a rare species found so far only in zone 3 of the Milton at Highgate Falls, Vermont.

The types are in the Yale University Museum.

Pseudagnostus extumidus, sp. nov.

Pl. 12, fig. 7.

Description.—Cephalon small, about as long as wide, reaching its greatest convexity near the posterior end. There is a relatively wide flattened border which is not set off by a sharply impressed furrow such as is usual in Agnostinae, and on either side there is a short spine. The glabella is wide, smooth, without furrows, and the broad shallow dorsal furrows are so lightly impressed that the outline is marked only by an obscure ridge encircling the convex portion of the cephalon. There is a small tubercle on the median line about one-third the distance from the back.

Measurements.—Length of cephalon (holotype) 2.5 mm., width 2.75 mm.; length of glabella 2 mm., width 1.25 mm.

Comparisons.—I have referred this species to Pseudagnostus, but it has more the appearance of a true Agnostus with the cephalon "smoothed out." It differs from other species of Pseudagnostus in lacking a cross-furrow on the glabella, and in having the anterior end of the median lobe definitely, although faintly, outlined.

The collection contains three specimens of a pygidium which may belong to this species. It is longer than wide, has the

features of the pygidium of Agnostus, but the dorsal and transverse furrows are very faint, so that the axial lobe almost merges into the general convexity. If cephalon and pygidium pertain to the same trilobite, a new genus must be made for their reception.

Horizon and locality.—Three specimens of the cephalon were found in zone 3 of the Milton at Highgate Falls, Vermont. Two of the pygidia mentioned were found in the same zone, and one in zone 2.

The type is in the Yale University Museum.

Subfamily *Condylopyginae* Raymond.

Peronopsis planulata, sp. nov.

Pl. 12, fig. 9.

Description.—Known from pygidium only. Pygidium only moderately convex, with very shallow dorsal furrows, and a flat border, which is widest posteriorly. Axial lobe only slightly elevated, not sharply delimited, two-thirds the total length. There is a small median tubercle situated two-thirds the length of the median lobe behind the anterior margin. In front of it is a very faint transverse furrow, and behind it an obscure one passes obliquely backward to the dorsal furrow on either side, delimiting an obscurely pentagonal posterior portion of the lobe. There appear to be no anterior accessory lobes, although a furrow is suggested at one side.

Measurements.—The holotype (pygidium) is 3.25 mm. long and 3.00 mm. wide; the axial lobe is 2.00 mm. long and 1.75 mm. wide at the front.

Comparisons.—Although many species of Peronopsis are known, few if any have the parts so obscurely delimited as in the one here described. There is an extremely faint median depression at the posterior end of the axial lobe which suggests the bifurcation in that region which is so conspicuous a feature of *Peronopsis fissa* (Lundgren) and *Peronopsis planicauda* (Angelin). *Peronopsis interstricta* (White) is somewhat similar, but has the median tubercle much farther forward. *Peronopsis callavei* (Raw) Lake has a similarly shaped posterior portion on the axial lobe of the pygidium, but is otherwise quite unlike *Peronopsis planulata.*

Horizon and locality.—A single pygidium was found in the main zone of the Milton at Highgate Falls, Vermont; it is no. 1729 in the Museum of Comparative Zoölogy.

Subfamily *Phalacrominae* Corda.

Phalacroma parilis (Hall).

Pl. 12, fig. 8.

Agnostus parilis Hall, 16th Rept. N. Y. State Cab. Nat. Hist., vol. 16, p. 178, pl. 10, figs. 24, 25, 1863.

A single specimen from Vermont corresponds very well with the shield which Hall described as the head of this species, lacking only the semi-lunate depression at the proximal end. That the width exceeds the length in our form is probably due to distortion, as a slight twisting of the shell is obvious.

Description.—The shield is smoothly and evenly convex, with a flattened margin which is widest at the distal end, and tapers proximally until the sides become evenly convex. At the articulatory or proximal end there is a projecting half-rib on either side, delimited by a very narrow furrow which is confined to the pleural lobes, and does not cross the median portion. This latter, if viewed in profile, is seen to be indented, and there is a small, median, forward-pointed tubercle at the crest of this concave area. This is not of course to be confounded with the upward-directed median tubercle near the middle of the shield. The conformation of the articulatory end indicates that this shield is a pygidium and not a cephalon as supposed by Hall. The concavity at the proximal end is the place of articulation with the hindermost thoracic segment, and since the edge of the shield went beneath the segment, it is evidently a pygidium and not a cephalon.

Measurements.—The pygidium is 3 mm. long and 3.25 mm. wide.

Horizon and locality.—The figured specimen was found in zone 2 of the Milton at Highgate Falls, Vermont, and is in the Yale University Museum. The originals were said by Hall to have been found in a "yellowish or drab-colored sandstone, on the shores of Lake Pepin." Walcott has reported the species from the Franconia formation.

Phalacroma cyclostigma, sp. nov.

Pl. 12, fig. 4.

Description.—Known from the cephalon only. Cephalon moderately and evenly convex, with a relatively wide, flat border; surface smooth, without furrows, but with the axial lobe suggested by three pairs of low, circular, flat-topped elevations, which, as the specimens are casts, indicate scars on the inner surface of the shield. Two of these elevations are situated close to the posterior margin, and the others are very close to and in front of them. The median tubercle is conspicuous, far back, conical, and surrounded by four of the scars. In front of the first pair of plainly visible scars are indistinct traces of another pair.

Measurements.—The holotype is 4.0 mm. long, 4.5 mm. wide near the front, and the median tubercle is 3.5 mm. from the anterior margin.

Comparisons.—This species differs from *Phalacroma parilis* (Hall) in having a somewhat less convex surface, a wider flattened border, and in the presence of three pairs of elevations on the cast. The latter feature distinguishes it from all other species of the genus.

Horizon and locality.—A rare species in the main zone of the Milton at Highgate Falls, Vermont. Type in the Yale University Museum.

Family SHUMARDIIDAE Lake.

Genus **Idiomesus**, nov.

Small blind trilobites with short dorsal furrows. Glabella broad, faintly or not at all delimited in front; not lobed.

Genotype, *Idiomesus tantillus*, sp. nov.

Idiomesus tantillus, sp. nov.

Pl. 12, fig. 10.

Description.—Cranidium small, semicircular in outline, gently convex, without concave border. Glabella long, oval in outline, without furrows. The dorsal furrows diverge gradually from the posterior margin to about the middle of the head, then converge and become very faint. On some specimens they disappear entirely; on others they can be traced until they unite in front of

the glabella close to the anterior margin. Fixed cheeks evenly convex, deflected at sides and front, ending in blunt genal angles. Occipital furrow narrow and deep, the marginal segment very narrow. There is a minute median pustule on the neck-ring. Surface smooth.

Measurements.—A cranidium is 2 mm. long, 4 mm. wide; the glabella is 1.25 mm. wide at the back and 1.50 mm. in the middle.

Comparisons.—The only species with which one can compare this form are members of the genus Shumardia. In that genus also the cephalon is small and without depressed border, but the glabella spreads out at the front.

Horizon and locality.—This is a common fossil in zones 2 and 3 of the Milton at Highgate Falls, Vermont. Type in the Yale University Museum.

Family ENDYMIONIIDAE Raymond.

Genus **Pseudosalteria**, nov.

Endymioniidae with depressed-convex, broad cephalon, elliptical glabella with no glabellar furrows or only faint traces of them.

Genotype, *Pseudosalteria laevis*, sp. nov.

This genus is proposed to include trilobites which resemble Endymionia but lack the lobation of the glabella, and also suggest Salteria, but have less strongly marked glabellar furrows, a shorter glabella, and no raised marginal rim. Free cheeks appear to have been exceedingly narrow, which of course differentiates the genera.

Pseudosalteria laevis, sp. nov.

Pl. 12, fig. 11.

Description.—Cephalon semicircular, depressed-convex, without concave border or raised rim on the margin. Glabella large, elliptical, raised only a little above the cheeks, outlined by a shallow circum-glabellar furrow. Two pairs of glabellar furrows and the neck-furrow are represented by three pairs of slight depressions on the sides of the glabella. Cheeks evenly convex, sloping down to the margin. Directly in front of the glabella there appears to be a convex border for a short distance. Except for the pair of depressions already mentioned there is no occipital furrow and the posterior margin of the head is somewhat beveled.

Measurements.—Length of cephalon 2.75 mm., width 5 mm.; length of glabella 2 mm., width in middle 1.75 mm.

Horizon and locality.—A single cephalon was obtained from zone 1 of the Milton at Highgate Falls, Vermont, and is in the Yale University Museum.

Pseudosalteria welleri, sp. nov.

Microdiscus ? sp. und., WELLER, Pal. New Jersey, vol. 3, p. 114, pl. 3, fig. 11, 1902.

Weller figured a single small imperfect cephalon which has the same outline as *Pseudosalteria laevis*, a similar glabella and cheeks. It differs chiefly in showing no traces of glabellar furrows and in having a narrow median longitudinal furrow in front of the glabella. The length is 5 mm.

Horizon and locality.—From the Upper Cambrian at Newton, New Jersey.

Order OPISTHOPARIA Beecher.

Family CONOCORYPHIDAE Angelin.

Genus **Phoreotropis**, nov.

This generic name is proposed for simple trilobites with very narrow, marginal free cheeks, small eyes, and with no concave border on the cephalon. The glabella is narrow, parallel-sided, or expanding slightly forward. Glabellar furrows nearly or quite absent.

Genotype, *Phoreotropis puteatus*, sp. nov.

Phoreotropis puteatus, sp. nov.

Pl. 12, fig. 12.

Description.—Cranidium small, nearly semicircular, without concave margin. Glabella long, narrow, parallel-sided, the dorsal furrows ending in pits beside the anterior end, which merges into the convex front of the cranidium. Glabellar furrows faint. The first two pairs are represented by small pits in the dorsal furrows; the last pair connect across the glabella as a very faint groove. Fixed cheeks wide, convex, about as high as the glabella. Palpebral lobes small, situated about half-way to the front. The

facial sutures extend almost straight forward from the eyes to the anterior margin, and back of the eyes curve outward and then backward to the posterior edge. The occipital furrow is narrow and faint, the segment narrow. Surface smooth.

Measurements.—Length 2 mm.; width at the palpebral lobes 2.25 mm., at the posterior margin 2.50 mm.

Comparisons.—This species differs from the *Idiomesus tantillus* in having a longer glabella, traces of glabellar furrows, and definite palpebral lobes. It is more like *Conocoryphe olenoides* Salter but has a shorter cranidium and there is no limitation of the front of the glabella.

It is of course quite possible that this trilobite is not mature, but if so, the adult form is still unknown.

Horizon and locality.—A single cranidium was found in zone 2 of the Milton at Highgate Falls, Vermont, and is in the Yale University Museum.

Phoreotropis transversus, sp. nov.

Pl. 12, fig. 16.

Description.—Cranidium less than three-fourths as long as wide, moderately convex, rather flat on the upper side. Glabella depressed convex, not greatly elevated above the cheeks; without furrows. The dorsal furrows are straight, converge slightly forward but do not meet in front of the glabella, the anterior end of which merges into the general surface. Palpebral lobes small, very far from the dorsal furrows, situated about midway in the length. Occipital furrow narrow, and faint on axial lobe, where it limits a narrow neck-ring, absent from the cheeks.

Measurements.—Length of cranidium (holotype) 2.75 mm.; width at palpebral lobes 3.50 mm., at posterior margin 4 mm.; width of glabella at back 1.75 mm.

Comparisons.—This species is distinguished from *Phoreotropis puteatus* chiefly by its relatively greater width.

Horizon and locality.—A single imperfect cranidium was obtained from zone 3 of the Milton at Highgate Falls, Vermont, and is in the Yale University Museum.

Phoreotropis olenoides (Salter).

Conocoryphe olenoides Salter, Mem. Geol. Surv. Great Britain, vol. 3, p. 308, pl. 8, fig. 6, 1866.

This species, known from a cranidium, has been imperfectly described but appears to be referable to the present genus. The glabella is narrow, but expands slightly forward, and the free cheeks are somewhat wider than in the American species.

Horizon and locality.—From the Upper Tremadoc at Garth, Portmadoc, Wales.

Family Olenidae Burmeister.

Genus **Zacompsus**, nov.

This generic name is suggested for trilobites apparently allied to Ctenopyge, but differing from that genus in the absence of glabellar furrows, the anterior enlargement of the glabella, and in having the eye-lines directed forward instead of backward. Orometopus has a somewhat similar cranidium, with a furrowless glabella, but shows a pair of anterior pits, posterior extra-glabellar mounds, and a nuchal spine, all of which produce an aspect which is on the whole, quite different from that of the specimens now to be described.

Genotype, *Zacompsus clarki*, sp. nov.

Zacompsus clarki, sp. nov.

Pl. 12, fig. 13.

Description.—Cranidium small, trapezoidal, the width about twice the length. Glabella narrow, enlarging forward and extending nearly to the front; anterior end semicircular in outline. No glabellar furrows present. Fixed cheeks wide, depressed toward the glabella and posterior margin, but rising toward the eyes, which are apparently far from the glabella, although lost from both the specimens so far found. The brim is narrow, mostly concave, without rim, but rises into two little mounds situated near the margin and in line with the dorsal furrows. A pair of high ocular ridges run forward and outward from the sides of the glabella, leaving it at about the mid-length. Occipi-

tal furrow narrow, deeper on the cheeks than on the axial lobe. Occipital segment very narrow.

Measurements.—A cranidium, the holotype, is 2 mm. long and 5 mm. wide. The glabella is 1.80 mm. long and 1 mm. wide at the widest point.

Horizon and locality.—Two cranidia were obtained from zone 2 of Milton at Highgate Falls, Vermont. Named for Dr. T. H. Clark, who is making contributions to the study of the "Taconic" question. Holotype in Yale University Museum.

Genus **Westergardia**, nov.

This name is proposed for a group of species now referred to Boeckia. They possess depressed-convex cephala, with a large smooth semi-elliptical glabella which reaches nearly to the anterior margin, and wide free cheeks with a narrow marginal rim. The position of the eyes is variable, either central, or far back. Only the cephalon is surely known.

Genotype, *Boeckia scanica* Westergard (1909, p. 50, pl. 1, figs. 9–13; 1922, pl. 16, fig. 40–43).

Westergard himself states that it is very doubtful if the two species, *Boeckia scanica* and *Boeckia ? illaenopsis* which he described from the Acerocare zone in southern Sweden really are congeneric with Wiman's genotype, *Boeckia mobergi* (Wiman, 1902, p. 81, pl. 5, fig. 9–13). This latter species has very much the aspect of a Ctenopyge in all parts, whereas the species *Boeckia scanica* and *Boeckia ? illaenopsis* resemble Peltura, and are even more like Cyclognathus, which appears to be the "smoothed out" member of the Peltura line (Westergard, 1922, p. 203, pl. 16). Westergardia appears to differ from Cyclognathus chiefly in having the eyes farther back and the glabella less elevated.

Westergard figures one nearly complete specimen as *Boeckia scanica*, but I have not included in the generic description any characteristics derived from it, because in the figure the eyes appear so far forward as to suggest *Cyclognathus granulatus* (Moberg and Moller). It has nine thoracic segments and a short, nearly semicircular pygidium. Cyclognathus is said to have from nine to twelve thoracic segments.

Genus Phylacterus, nov.

Olenidae apparently allied to Westergardia, but with an angulated raised rim on the front of the cranidium. Facial sutures as in Cyclognathus.

Genotype, *Phylacterus saylesi*, sp. nov.

Phylacterus saylesi, sp. nov.

Pl. 12, figs. 15, 16, 18.

Description.—Cranidium short and broad, indicating a cephalon nearly semicircular in outline. Glabella ovate, about two-thirds the total length, moderately convex, tapering but little toward the front, and bearing two pairs of short, obliquely placed furrows. The cheeks rise in a gentle, convex curve from the dorsal furrows, forming a low smooth ridge in front of the glabella, and broad cheeks at the sides. The eyes are apparently small, although the palpebral lobes are broken from all specimens in the collection, and situated at about the midway of the cranidium, at some distance from the glabella, to frontal lobe of which they are connected by ocular ridges. The fixed cheeks back of the eyes extend far outward. At the middle of the front of the cranidium there is for a short distance a raised border, separated by a narrow furrow from the roll behind it. This border is crossed by the facial sutures, giving a triangular appearance to the front. An obscure ridge passes along the median line from the border across the furrow behind it, and through a slight depression in the roll to the front of the glabella. The surface of the whole is granulose.

A pygidium which may well belong to this species is small, with a wide, prominent axial lobe, and narrow, depressed lateral ones. The axial lobe has one prominent ring and two faint ones. The pleural lobes are so far depressed as to be almost concave and each has two narrow ribs close to the anterior margin, separated by a deep furrow. The posterior rib is often obscure. There is a very narrow slightly convex rim.

Measurements.—The cranidium selected as the holotype is 7.0 mm. long, about 7.0 mm. wide at the palpebral lobes, and 12.5 mm. at the nuchal segment. The glabella is 4.5 mm. long and 4.0 mm. wide at the base.

The pygidium (paratype) is 2 mm. long, 2.75 mm. wide, and the axial lobe is 1.75 mm. long and 1.25 mm. wide at the front.

Comparisons.—This species has a longer and narrower cephalon than *Phylacterus fraternus*, glabellar furrows, although obscure, are present, and the longitudinal ridge in front of the glabella is more obscure. The very wide fixed cheek, which indicates that the posterior end of the free cheek must have had the peculiar form of that of Cyclognathus, allies this form with Westergardia, but the presence of the angulated rim and wide brim precludes its inclusion in that genus.

Horizon and locality.—A number of specimens have been found in the main fossiliferous zone at Highgate Falls, Vermont. Named for Mr. Robert W. Sayles.

The types are in the Yale University Museum.

Phylacterus fraternus, sp. nov.

Pl. 12, fig. 19.

Description.—Cranidium small, about half as long as wide, gently convex, sloping downward and outward at the sides. Glabella nearly one-third the total width, semi-elliptical, depressed convex. Circum-glabellar furrow wide and shallow, extending in front as a shallow median depression crossing the brim. Eyes small, midway in the cephalon, distant from the glabella about one-half its width. Eye-lines are present, but very faint. Back of the eyes the facial sutures continue backward but a very short distance, then turn abruptly outward to the genal angles, making very wide fixed cheeks as in Peltura, Cyclognathus and their allies. The occipital furrow is shallow on the axial lobe, narrow but distinct on the cheeks.

Measurements.—Length of the cranidium (holotype) 3.5 mm., width at palpebral lobes 4.5 mm., width at posterior margin 6.5 mm.; length of glabella 2.25 mm., width at back 2 mm.

Comparisons.—This species is very like *Westergardia scanica*, but has a proportionally narrower glabella and a wider brim. *Westergardia illaenopsis* has the eyes much farther back. The cranidium is shorter than that of *Phylacterus saylesi*.

Horizon and locality.—There is a single specimen from zone 3 of the Milton at Highgate Falls, Vermont.

Family SOLENOPLEURIDAE Angelin.

Genus **Onchonotus**, nov.

Levisia WALCOTT, (partim), Smithson. Misc. Coll., vol. 7, no. 4, p. 86, 1911.

Levisia was not, as would be supposed, based upon a Canadian trilobite, but upon *Agraulos agenor* Walcott, a member of the Chinese Middle Cambrian fauna. The type is a minute cranidium with a large, strongly convex glabella, a broad, blunt occipital spine, and rather wide, elevated fixed cheeks. Walcott named and figured two species from Lévis as members of this genus. These forms, known as *Levisia richardsoni* and *Levisia nasuta*, differ from *Levisia agenor* in lacking an occipital spine and in having the fixed cheeks depressed, drooping away from the glabella, instead of rising into high ridges outside the dorsal furrows. The brim of the type is convex, separated from the glabella by a very narrow concave region, whereas in the species from Lévis, the brim is concave, with a narrow rim.

Levisia richardsoni and *Levisia nasuta* are forms which earlier students of the fossils in the boulders at Lévis have identified as *Menocephalus globosus*. They agree with that species in the drooping cheeks, the highly convex, unfurrowed glabella, and the small eyes. All three have a peculiar tongue-like anterior prolongation of the brim. The chief difference is that *Menocephalus globosus* has a pustulose surface, whereas that of the species referred by Walcott to Levisia is smooth or finely reticulate. The genus Menocephalus will have to be discarded. Owen (1852, p. 577, pl. 1, fig. 11) proposed the name for a glabella and part of a cheek, inadequately figured and described, and, according to Walcott (1913, p. 172) the type is lost. Dr. Walcott, after studying specimens from the original locality could not identify the species, and nothing can be gained by trying to preserve the name. The three species, *Levisia richardsoni*, *Levisia nasuta*, and *Menocephalus globosus*, appear to be congeneric, and for them the name Onchonotus is proposed, with the following description.

Description.—Opisthoparia with bulbous, nearly or quite unfurrowed glabella, wide drooping cheeks and nasute brim, small eyes at or just in front of the middle of the head.

Genotype, *Menocephalus globosus* Billings.

This genus is closely allied to Clelandia Cossman (Harrisia, Cleland, 1900 p. 127, pl. 16, fig. 1–3). Both have drooping cheeks and a nasute projection in front of the glabella, small eyes, and unfurrowed glabella. The free cheeks meet in front of the glabella in Clelandia, however, and are widely separated in Onchonotus. The eyes of the former are far forward, opposite the anterior end of the glabella.

Onchonotus richardsoni (Walcott).

Levisia richardsoni Walcott, Smithson. Misc. Coll., vol. 57, no. 4, pl. 17, figs. 4, 4a, 1911; Cambrian Fauna of China, p. 178, 1913.

Walcott named and figured *Levisia richardsoni* and *Levisia nasuta* from specimens obtained from the boulders at Lévis. In the absence of any description of either species one is obliged to depend upon the figures, from which I infer that *Levisia richardsoni* differs from *Levisia nasuta* in having a wider occipital segment and in having the edge of the brim turned up instead of down. There are in the Museum of Comparative Zoölogy several cranidia which may be assigned to Onchonotus, and two species appear to be represented, neither of them *Onchonotus globosus*. The one with the wider occipital ring I take to be *Onchonotus richardsoni*. The other can definitely be identified as *Onchonotus nasutus*.

The cranidium from Lévis, which I believe to represent *Onchonotus richardsoni*, has a large, highly convex glabella which is longer than wide, rises abruptly from the occipital furrow, and tapers very slightly toward the front. The brim slopes downward away from the glabella, is nearly flat, with a slightly nasute up-turned anterior border. The fixed cheeks back of the eyes are small, bowed downward, and the narrow, deep, occipital furrow marks off a narrow raised marginal border. The neck-furrow on the axial lobe is deeper and wider than on the cheeks, and the neck-ring is extended a little backward and upward. The palpebral lobes are of medium size and their centers are only slightly in front of the middle of the head. The shell is

entirely removed so the nature of the surface cannot be ascertained.

Measurements.—Length of cranidium 11 mm.; width at palpebral lobes 10 mm., at posterior margin about 17 mm. Length of glabella 7 mm., width at back 6 mm.

Horizon and locality.—This species has so far been found only in the boulders of the conglomerate at Lévis, Province of Quebec.

Onchonotus nasutus (Walcott).

Levisia nasuta Walcott, Smithson. Misc. Coll., vol. 57, no. 4, p. 87, text-figs. 7, 7a, pl. 17, fig. 5, 1911; Research in China, vol. 3, p. 178, 1913.

Description.—Cephalon very highly convex, surmounted by a vaulted glabella which is longer than wide, evenly convex, and without furrows. The brim is concave, turns downward, and then up at its tongue-like median projection. Dorsal furrows narrow, not deep, cheeks convex, drooping. Eyes small, slightly in front of the middle, and very close to the glabella. Occipital furrow narrow but deep, the segment, including the neck-ring, narrow. Free cheeks large, convex, with a narrow raised border, and a short genal spine.

Measurements.—This species appears to differ from *Onchonotus richardsoni* only in having a narrower neck-ring, though possibly the eyes are a little smaller, closer to the glabella, and farther forward.

Horizon and locality.—Specimens which appear to belong to this species are fairly common at Highgate Falls, Vermont, in zones 2 and 3 of the Milton. All are smaller than any yet seen from Lévis and at sight appear to have a higher and narrower glabella. This is not, however, borne out by measurements. The original locality was at Lévis, Province of Quebec, where the species seems to be fairly common in some of the boulders of the conglomerates.

Hystricurus mammatus, sp. nov.

Pl. 12, fig. 17.

Description.—Known only from the pygidium, which differs from that of *Hystricurus cordai* (Billings) in being longer, but with a relatively shorter axial lobe. The specimen is laterally

compressed, but the pleural lobes appear to have been naturally narrow, and, besides the anterior half-rib, there are only two pairs of ridges on them. Each rib bears two pairs of elongate pustules on its inner half, and a pair of pustules on either side indicates the position of a third pair of ribs. The axial lobe is convex, narrow, expands forward, and shows six rings, each with a row of elongated pustules. The ribs are short so that there is a wide smooth border, which slopes rather steeply and is not definitely concave.

Measurements.—Length of pygidium 12 mm., width 11 mm.; length of axial lobe 9 mm., width at front 4 mm. As the specimen is laterally compressed, these widths are too small.

Horizon and locality.—From the Georgia formation, 4.5 miles north of Highgate, Vermont. Type in the Yale University Museum.

Family Asaphiscidae, nov.

There are a number of trilobites with relatively large pygidia and few thoracic segments, which have somewhat the appearance of members of the Asaphidae, and have sometimes been referred to that family, or to the Bathyuridae.

The Asaphiscidae differ from the Asaphidae in having a variable number of thoracic segments (7–11), in having the glabella always tapering forward, whereas it generally expands forward in the Asaphidae, and in retaining many primitive characteristics which are lost by most members of the Asaphidae. For example, the facial suture is always marginal at the front, eye-lines are generally present, the axial lobe is always narrow, and is always well defined, even in specialized forms (Blountia). The Bathyuridae differ from the Asaphiscidae in having a longer, parallel-sided glabella, a fixed number of thoracic segments, and, usually, larger eyes.

Just what genera really belong to the family cannot be fully determined. Asaphiscus Meek, Blountia Walcott, and Maryvillia Walcott appear to be rather closely allied, and Blainia Walcott probably belongs to the family, although it has a more primitive cephalon than Asaphiscus. Lloydia Vogdes can apparently be placed in the Asaphiscidae, although the glabella is much longer than in the genera previously mentioned.

Asaphiscus inornatus, sp. nov.

Pl. 12, fig. 23.

Description.—Cranidium more than half as long as wide, depressed-convex, smooth. Glabella large, depressed-convex, semi-elliptical, rounded in front, without glabellar furrows. Brim flat, sloping gently away from the glabella, then suddenly turned upward to form a convex, lip-like border. Palpebral lobes of medium size, close to the dorsal furrows. The facial sutures are practically identical in course with those of *Asaphiscus wheeleri*. Occipital furrow broad and shallow, the segment narrow and flat.

Measurements.—The cranidium (holotype) is 8 mm. long, 6.25 mm. wide at the palpebral lobes and 11 mm. at the posterior margin.

Comparisons.—This cranidium is, except for the absence of eye-lines, an almost exact miniature of that of *Asaphiscus wheeleri*. It undoubtedly does not belong to that species, however, and it should be pointed out that, with only isolated cranidia at hand it is not possible to make even the generic identification with confidence.

Horizon and locality.—Two cranidia were found in zone 1 of the Milton at Highgate Falls, Vermont, and are in the Yale University Museum.

Blountia imitator, sp. nov.

Pl. 12, fig. 22.

Description.—Cranidium small, sub-rectangular, moderately convex. Glabella semi-elliptical in outline, short, highly convex, without furrows. Brim gently convex, nearly flat, inclined downward, and bordered by an upturned edge. Palpebral lobes large, close to the dorsal furrows. The course of the facial suture from the anterior end of the eye is straight, and makes an angle of about 30° with a line parallel to the axis. Occipital furrow shallow, the segment flat.

Measurements.—Length of cranidium of holotype 5.75 mm., width at palpebral lobes 5.75 mm.

Comparisons.—This species somewhat closely resembles *Asaphiscus inornatus*, but is more convex, proportionally shorter, and has a somewhat narrower brim. It has much the same form as

the type of the genus, *Blountia mimula* Walcott (1916, p. 399, pl. 61, fig. 4–4c) but has a shorter and more elevated glabella.

Horizon and locality.—A single cranidium was found in zone 2 of the Milton at Highgate Falls, Vermont, and is in the Yale University Museum. The other species of the genus are all in the Upper Cambrian of eastern Tennessee.

Maryvillia triangularis, sp. nov.

Pl. 12, fig. 21.

Description.—Two imperfect pygidia appear referable to this genus. They are almost triangular, evenly convex, without depressed border. The axial lobe is narrow, with very faintly outlined rings, and extends nearly to the posterior end. The pleural lobe shows the usual anterior half-rib, and faint traces of five or six more.

Measurements.—A pygidium is 8.25 mm. long, was approximately 12 mm. wide at the front, and the axial lobe is 7 mm. long.

Comparisons.—It may be that this species should have been referred to Blountia rather than Maryvillia, but although the axial lobe is nearly destroyed, it shows sufficient remnants of rings to indicate Maryvillia. Moreover, this pygidium is 8.25 mm. long, and Dr. Walcott states that no known species of Blountia appears to have been much over 10 mm. in length when entire, whereas Maryvillia is a larger trilobite. An important feature in the present species is the absence of a concave border which is characteristic also of *Maryvillia ariston* Walcott (1916, p. 401, pl. 64, fig. 5a).

Horizon and locality.—A single specimen was found in zone 3 at Highgate Falls, Vermont, and another in the Highgate at Highgate Center. The former is the holotype, and is in the Yale University Museum.

Lloydia seelyi (Walcott).

Pagodia seelyi Walcott, Smithson. Misc. Coll., vol. 57, no. 9, p. 269, pl. 44, figs. 12, 12a, 13, 13a, 14, 14a, 1912.

The species which Dr. Walcott figured under this name has a long pygidium which is quite typically Lloydia-like, with its narrow, smooth border, long axial and smooth pleural lobes.

The pygidium of Pagodia on the other hand, is short, rounded behind and has conspicuous ribs.

The cranidium of *Pagodia scelyi* is, it is true, very like that of *Pogodia lotos*, but it is also like that of *Lloydia oblonga*. If cranidium and pygidium belong together, as they probably do, it seems more natural to refer them to an American than to a Chinese genus.

Description.—The pygidium is long, narrow, somewhat triangular, with a narrow elevated border which is conspicuously continuous with the anterior half-segment. The axial lobe is narrow, with three rings at the anterior end, the posterior portion smooth. Pleural lobes evenly convex, smooth, separated from the border by a narrow but distinct furrow.

Measurements.—Length of pygidium 9 mm.; width at anterior end 9.5 mm.; width of axial lobe at anterior end 2.25 mm.

Comparisons.—These pygidia have two less rings on the axial lobe than the specimen figured by Walcott, but otherwise the agreement is perfect. They differ from *Lloydia saffordi* (Billings) in being smaller, proportionately longer, and in having a narrower axial lobe.

Horizon and locality.—One flattened pygidium was obtained from zone 3 of the Milton at Highgate Falls, Vermont, and another not crushed but with the axial lobe somewhat damaged, from the lower part of the Highgate limestone, north of Highgate Center, Vermont. The original specimens described by Walcott were found in the Potsdam sandstone near Port Henry, New York.

Lloydia saffordi (Billings).

This species is very common in the Beekmantown at Philipsburg, Province of Quebec, and in the conglomerates at Point Lévis. A single imperfect pygidium was obtained from the Georgia formation 4.5 miles north of Highgate Center, Vermont. It is somewhat more than usually convex, and the border is a little wider than usual, but it comes within the limits of the variations shown by specimens from Philipsburg.

Pygidia from the Williston formation on the Hinesburg Road southeast from Burlington, Vermont, have the typical shape of

Lloydia saffordi, but the annulation of the axial lobe is unusually faint. This does not, however, seem sufficiently important to justify a specific separation.

In the lower part of the Highgate limestone about 1.5 miles north of Highgate Center representatives of this genus appear to be fairly common, and show considerable variations. Six entire pygidia were obtained: five which may be assigned to the typical variety, and one which agrees with a broad-margined type found also at Philipsburg.

Family Ellipsocephalidae Matthew.

Genus **Plethopeltis** Raymond.

Plethopeltis Raymond, Victoria Memorial Mus., bull. 1, p. 64, 1913.–Field, Ottawa Naturalist, vol. 29, p. 37, 1915.

This genus was proposed to include trilobites which are related to Agraulos, but whose cephala have become nearly smooth, through the total loss of the glabellar furrows. The circum-glabellar furrow is also narrow and shallow. In proposing the genus, I had in mind such a trilobite as *Bathyurus armatus* Billings, but unfortunately selected as the genotype *Agraulos saratogensis* Walcott. At the time my paper was written, the latter species was known only from Walcott's diagnosis and figure of 1890, but in his more detailed description of the Saratogan fauna in 1912, *Agraulos saratogensis* was assigned quite different characteristics. As Field pointed out, the specimens figured in Walcott's later paper represent two distinct forms, one of them with very faint glabellar furrows, the other with two pairs of deeply incised ones. Neither unfortunately, is the holotype, and the text makes no reference to the amount of variability within the species. It therefore becomes necessary to restudy the typical species before the value of the genus can be properly appraised.

Plethopeltis saratogensis (Walcott).

Bathyurus armatus Walcott (*nec* Billings), 32d Ann. Rept. N. Y. State Museum, p. 131, 1879.

Ptychoparia (*Agraulos*) *saratogensis* Walcott, Bull. U. S. Geol. Surv., no. 30, p. 31, 1886 (*nomen nudum*).

Ptychoparia saratogensis Dwight, Trans. Vassar Bros. Inst., vol. 4, pp. 207, 208, 1887 (*nomen nudum*).

Ptychoparia (*Agraulos*) *saratogensis* LESLEY, Geol. Surv. Penna., Rept. 4 P, Dict. of Fossils, vol. 2, p. 834, fig. 1–4, 1888.

Agraulos saratogensis WALCOTT, Proc. U. S. Nat. Mus., vol. 13, pl. 21, fig. 14, 1890; Smithson. Misc. Coll., vol. 57, p. 269, pl. 43, fig. 11–15, 1912. Not *Agraulos saratogensis* WELLER, Geol. Surv. New Jersey, vol. 3, pp. 118, 119, pl. 1, fig. 7–9, 1903.

This species, as at present defined, is the most abundant of all the trilobites in the Hoyt limestone at the typical locality four miles west of Saratoga. As noted above, Walcott has figured three forms under this name: the original one with glabellar furrows so faint as to be hardly visible, and not shown on the figure (1890, fig. 14); the second (1912, figs. 11, 11a) has faint glabellar and deep dorsal furrows; and the third (1912, figs. 14, 14a) has both the dorsal and the glabellar furrows deeply impressed.

A collection of 37 cranidia from the typical locality contains examples of the first two of these forms, but not the last. More abundant than either is one which has no glabellar and only slightly impressed dorsal furrows, 22 of the specimens belonging to this form. Since the specimen originally described by Walcott had very faint glabellar furrows, that form may be taken as typical of the species. It was at first thought that the specimens with glabellar furrows were immature and the others adult, but since there are large and small individuals of both sorts, it is evident that this is not the explanation. Neither is the difference due to state of preservation for there are specimens of both kinds which retain the test.

Two forms must, then, be recognized, either as representing one variable species, or two distinct but closely related ones. That the latter is the more probable is indicated by the fact that there are two kinds of pygidia associated with the cephala, one much smoother than the other. It is very possible that the smoother cephala and pygidia belong together, and they are accordingly described as a new species. With this form eliminated, the genus Plethopeltis has as its type a trilobite with an almost smooth glabella, but which retains traces of glabellar furrows. The dorsal furrows are narrow but distinct and unite in front. The fixed cheeks form convex lateral and frontal slopes. The new species which is associated with *Plethopeltis saratogensis* is obviously so closely related that the generic definition must be broad-

ened to include species without glabellar furrows, and Plethopeltis may be employed as a designation for those descendents of Agraulos which have a shorter and more convex cephalon, but which still retain a circum-glabellar furrow, or traces of it.

Plethopeltis walcotti, sp. nov.

Pl. 12, figs. 20, 24.

This name is proposed for the smooth Plethopeltis associated with *Plethopeltis saratogensis* and referred to under that heading.

Description.—Cranidium convex, the length equal to the width between the tips of the fixed cheeks. Glabella half-oval, raised above the general surface, outlined by a narrow circum-glabellar furrow which is generally faintly impressed, but somewhat conspicuous on some specimens. Eyes large, with rather small, flat, lunate palpebral lobes which are situated a little in front of the middle of the cephalon, and close to the dorsal furrows. Nuchal furrow shallow, deepest over the median lobe, fading out at the dorsal furrows, then extending across the fixed cheeks as a narrow, deep groove. The whole neck-ring back of the glabella projects backward in a short, broad, blunt point which is turned slightly upward. The portions of the fixed cheeks back of the eyes are triangular and only gently curved; those in front curve abruptly downward from the circum-glabellar furrow. Free cheeks associated with the cranidia have the same form as those of *Plethopeltis saratogensis*. The genal angles are produced into short, acutely angular spines which are oval in section. Thorax unknown.

The associated pygidium is a little more than half as long as broad, with a highly elevated axial lobe, and no concave border. The axial lobe extends four-fifths the length and occupies slightly more than one-third the width. There are three well-defined rings besides the anterior half-ring. The pleural lobes are very nearly smooth, with an anterior, ill-defined rib.

Measurements.—The holotype, a cranidium, is 7 mm. long and 5 mm. wide at palpebral lobes; the glabella,—nuchal furrow to anterior end,—is 4.5 mm. long and 4 mm. wide at the back. The largest cranidium in the collection is 14 mm. long, the smallest 4 mm. A pygidium, paratype, is 5 mm. long and 9 mm.

wide; the axial lobe is 4 mm. long and 3.25 mm. wide at the front.

Horizon and locality.—A common fossil in the Hoyt limestone at the Hoyt quarry four miles west of Saratoga, New York.

Holotype no. 1730, paratype no. 1731, Museum of Comparative Zoölogy.

Plethopeltis welleri, sp. nov.

Agraulos saratogensis WELLER, Pal. New Jersey, vol. 3, p. 118, pl. 1, fig. 7–9, 1903.

Description.—The cranidium of the specimen described and figured by Weller is practically identical with those on which *Plethopeltis walcotti* is based, but the free cheek has a much shorter genal spine, and the pygidium is much narrower, with a wider axial lobe which is not bounded posteriorly, but merges into the general surface. Although the principal differences from *Plethopeltis walcotti* are found in the pygidium, which may possibly not be correctly associated with the cranidium, it seems best to assign this species a distinct specific name.

Horizon and locality.—This species was found by Weller in the upper part of the Cambrian about one-half mile north of Blairstown, New Jersey.

Plethopeltis hemispherica (Berkey).

Agraulos hemisphericus BERKEY, American Geologist, vol. 21, p. 289, pl. 20, figs. 14, 15, 1898.

This species is to be referred to Plethopeltis although the eyes are rather farther apart than in the eastern forms. The glabella is less distinctly outlined, less convex, and shorter than that of *Plethopeltis walcotti*, but more sharply set off from the cheeks than in *Plethopeltis armata*. The cranidium is much more nearly square and the fixed cheeks are narrower and more extended laterally behind the eyes than is usual in the genus. It is also noteworthy that the nuchal segment is not drawn out into a blunt spine.

Berkey gives the following measurements: length of head 15 mm., width 21 mm.; length of glabella 10 mm., exclusive of occipital ring; anterior width 7 mm., posterior width 9 mm.

Horizon and locality.—Berkey's original specimens were from the Upper Cambrian (Franconia) at Taylor's Falls, Minnesota. Mr. W. A. Finkelnberg collected at Ironton, Wisconsin, two cranidia which are now in the Museum of Comparative Zoölogy.

Plethopeltis arenicola, sp. nov.

Pl. 13, fig. 1.

Three cranidia from the Upper Cambrian of Wisconsin represent a new species of Plethopeltis allied to *Plethopeltis hemispherica*.

Description.—Cranidium almost evenly convex, the glabella rising above the general surface only at the posterior end. Dorsal furrows obsolete except as faint depressions at the posterior ends. Nuchal furrow very faintly impressed; nuchal ring narrow, without an axial point. Palpebral lobes not well preserved, but apparently small, narrow, and situated slightly behind the middle. All specimens are casts of the interior preserved in sand, and the furrows may have been more deeply impressed on the shell, although this is not to be expected.

Measurements.—Holotype: length of cranidium 19 mm., width at palpebral lobes 21 mm.; width of axial lobe at posterior margin 12 mm. Another cranidium is 20 mm. long and about 21 mm. wide at the palpebral lobes.

Horizon and locality.—The specimens were collected by Mr. W. A. Finkelnberg at an undetermined horizon of the Upper Cambrian at Ironton, Wisconsin, and are now in the Museum of Comparative Zoölogy. The holotype is no. 1732.

Plethopeltis armata (Billings).

Bathyurus armatus Billings, Canadian Nat. and Geol., vol. 5, p. 319, fig. 23, 1860; Geology of Canada, p. 238, fig. 273, 1863; Pal. Foss. Canada, vol. 1, p. 411, fig. 392, 1865.

Plethopeltis armata Raymond, Bull. Victoria Mem. Mus., p. 65, pl. 7, fig. 18, 1913.

Two cranidia have been identified as belonging to this species. They are much smaller than the type but have the same outline and the characteristic nuchal spine, which is somewhat longer than in other species of the genus. The dorsal furrows show only along the posterior portion of the glabella.

Measurements.—Length of a cranidium 6 mm.; width at fixed cheeks about 6 mm.; width of glabella at posterior end 3 mm. Billings' type is 18 mm. long.

Horizon and locality.—The type was obtained (probably from a boulder) from Limestone No. 1, a conglomerate, at Point Lévis, Quebec. Professors Schuchert and Dunbar collected two specimens from their zone 3 and another from zone 2 of the Milton formation in the gorge at Highgate Falls, Vermont.

Plethopeltis laevis, sp. nov.

Pl. 13, fig. 3.

Description.—This species may be briefly characterized by stating in what particulars it differs from those to which it is closely allied. It belongs to the group without a nuchal spine, which at once eliminates all except *Plethopeltis angusta*, *Plethopeltis lata*, and *Plethopeltis arenicola*. It is wider than *Plethopeltis angusta*, has the eyes nearer the glabella, hence wider free cheeks than *Plethopeltis lata*, and has a much more sharply delimited and prominent neck-ring than *Plethopeltis arenicola*. The glabella is faintly outlined by furrows which extend nearly as far as the eyes.

Measurements.—Length of holotype 4.75 mm.; width at palpebral lobes 3.5 mm.; width at fixed cheeks 5.75 mm.

Horizon and locality.—Six cranidia of this species were collected from zone 3 of the Milton at Highgate Falls, Vermont.

The holotype is in the Yale University Museum.

Plethopeltis angusta, sp. nov.

Pl. 13, figs. 4, 8.

Description.—Cephalon narrow, highly vaulted, compressed so that the fixed and free cheeks are nearly vertical, and hardly visible from above. Glabella entirely smooth, not outlined in any way. Nuchal furrow obsolete on fixed and free cheeks, faintly visible across the axial lobe. Nuchal segment drawn out into a short blunt spine. The eyes are very small, situated just in front of the middle of the cephalon, and half-way down the lateral slopes. The free cheeks are wide, smooth, and have broadly rounded genal angles which extend but slightly behind the tip of the nuchal spine.

Measurements.—The holotype is 5 mm. long, 3.75 mm. wide at the palpebral lobes, and 4.75 mm. wide at the genal angles. Notches in the posterior margin, which indicate the position of the posterior ends of the dorsal furrows, are 2.75 mm. apart. A cranidium from Highgate Falls is 7 mm. long and 5.5 mm. wide at the palpebral lobes.

Comparisons.—In this species the "smoothing out" of the cephalon is complete except for the retention of a faint elevation in the axial region, but the nuchal spine has been retained, not lost as in *Plethopeltis arenicola*. The steepness of the cheeks makes the head unusually narrow, a characteristic by which it can easily be recognized.

Horizon and locality.—My first acquaintance with this little fossil was in 1910, when I found a perfect cephalon in a pebble in a conglomerate at St. Philip de Neri, about 30 miles southwest of Rivière de Loup, Quebec. This specimen was, unfortunately, a victim to the energy of the charwomen who periodically descended upon my office.

The cephalon now used as a holotype was collected many years ago by Jules Marcou from a pebble in one of the limestone conglomerates at Lévis, Province of Quebec, and is no. 1733 in the Museum of Comparative Zoölogy. Professors Schuchert and Dunbar collected a single cranidium in zone 2 of the Milton formation at Highgate Falls, Vermont.

Plethopeltis lata, sp. nov.

Pl. 13, fig. 5.

Description.—Cranidium short, two-thirds as long as wide, and nearly uniformly convex. Glabella raised only slightly above the general surface. Dorsal furrows obsolete except as depressions on either side at the posterior margin. The fixed cheeks are strongly convex, continuing the curvature of the glabella, and not depressed below it as in many species of the genus. The eyes are situated in front of the middle, well down on the sides of the cranidium, and have small, narrow palpebral lobes. The occipital furrow is narrow, not deeply impressed on the axial region. The nuchal segment is narrow, with a low median tubercle which

has the appearance of being a vestige of the spine possessed by many other species of the genus.

Measurements.—The type is 4 mm. long and 6 mm. in width between the tips of the fixed cheeks. The glabella is 2.5 mm. wide at the posterior end. Another specimen is 5 mm. long, 7.25 mm. wide, and the glabella is 3.5 mm. wide at the posterior end.

Comparisons.—This species is in many respects a miniature of *Plethopeltis arenicola*, from which it differs chiefly in the form of the nuchal segment and the position of the eyes. The glabella is less prominent than that of *Plethopeltis walcotti* or *Plethopeltis welleri*, and the nuchal segment is not drawn out into a spine.

Horizon and locality.—Nine cranidia of this species were found in zone 3, one in zone 2, and in zone 1 of the Milton formation in the gorge at Highgate Falls, New York. Type in Yale University Museum.

Plethopeltis convergens, sp. nov.

Pl. 13, fig. 2.

Description.—Cranidium elongate, moderately convex, tapering toward the front. Viewed laterally, the profile shows an even curvature, the greatest convexity being in the middle. Eyes with long, very narrow palpebral lobes situated about half-way to the front. There is no nuchal furrow behind the glabella, but a faint one crosses the fixed cheek. Close to the posterior margin, on the median line, is a minute tubercle which appears to be the only vestige of a median spine.

Measurements.—Length of cranidium 11 mm.; width at palpebral lobes 7 mm.; at posterior margin about 9 mm.

Horizon and locality.—One cranidium was collected from zone 3 of the Milton at Highgate Falls, Vermont. Holotype in the Yale University Museum.

Genus Stenopilus, nov.

The various species of Plethopeltis described on the preceding pages show gradations from the typical species, *Plethopeltis saratogensis*, with distinct dorsal and faint glabellar furrows, to species which have neither of these classes of furrows and culminate in a

form, *Plethopeltis convergens*, which has progressed farther and lost the nuchal furrow as well, but retains the nuchal spine.

The genus Stenopilus is suggested to include those derivatives of Plethopeltis which have gone one step farther, and have lost not only the furrows but the nuchal spine as well. Since there are so many gradations present in the series it would be possible to put the type of Stenopilus as a species under Plethopeltis. On the other hand, if only the extremes be considered, Plethopeltis and Stenopilus deserve generic separation.

The genotype is *Stenopilus pronus*, sp. nov.

Stenopilus pronus, sp. nov.

Pl. 13, figs. 6, 7.

Description.—Cranidium half-oval in outline, strongly convex, the summit of the convexity being reached near the posterior end, so that the shield appears somewhat hump-backed. There is nothing to indicate the outline of the glabella, so completely is it merged with the general surface and all slopes are steeply convex. The eyes are situated about the middle of the head, and have long but very narrow palpebral lobes. The sharp bend in the curvature of the cranidium shows that in life the long axis of the head must have made an angle of about 120° with that of the body, so that the animal must have presented a rather grotesque appearance.

Measurements.—The holotype is 14 mm. long, 9 mm. wide at the palpebral lobes, and about 11 mm. wide at the posterior margin. Another cranidium is 17 mm. long, but a number are shorter than the type.

Horizon and locality.—Eight cranidia of this species were found in zone 3 of the Milton at Highgate Falls, Vermont. Type in the Yale University Museum.

Stenopilus brevis, sp. nov.

Pl. 13, fig. 9.

Description.—Cranidium small, short, convex, with steep frontal and lateral slopes. No glabellar, dorsal or occipital furrows present. Palpebral lobes either absent, or so narrow and ill-defined as to be unrecognizable. Fixed cheeks narrow. Surface punctate.

Measurements.—The holotype is 3.5 mm. long and 4.25 mm. wide at the posterior margin. Other cranidia are of about the same size or slightly smaller.

Comparisons.—The almost featureless, short, convex cranidium of this species cannot readily be confused with that of any other known trilobite. The practical loss of eyes is interesting, particularly as it does not seem to be accompanied by any fusion of fixed and free cheeks. This would seem to be the limit of variation from Plethopeltis in the direction of loss of furrows.

Horizon and locality.—Five cranidia were collected in zone 2 of the Milton at Highgate Falls, Vermont, and are in the Yale University Museum.

Family Corynexochidae Angelin.

Subfamily *Corynexochinae*, nov.

Genus **Corynexochus** Angelin.

Corynexochus juvenis, sp. nov.
Pl. 13, fig. 10.

Description.—Cranidium small, about as long as wide. Glabella large, convex, expanding forward, extending to the front, bounded by narrow, sharp dorsal furrows. It begins to expand at the mid-length and there are faint traces of two pairs of glabellar furrows. Fixed cheeks depressed-convex, palpebral lobes small, situated at about the middle of the length, near the glabella but separated from the dorsal furrows by about their own width. Back of the eye the facial suture makes a smooth curve outward and backward to the posterior margin. In front it curves outward and then forward to the margin, leaving a depressed lappet on either side of the glabella. Surface smooth.

Measurements.—The cranidium (holotype) is 2 mm. long, 2 mm. wide at the palpebral lobes and 3 mm. at the back. The glabella is 1 mm. wide at the back and 1.5 mm. at the front.

Comparisons.—No representative of this genus has previously been found in strata younger than the Middle Cambrian. Its general form is exactly that of the genotype, *Corynexochus spinulosus* Angelin, but it has only faint glabellar furrows. Walcott (1916, p. 309, *et seq.*) has listed several Lower and Middle

Cambrian species as belonging to this genus. This species rather closely resembles some of the Lower Cambrian forms.

Horizon and locality.—A single cranidium was obtained from zone 2 of the Milton at Highgate Falls, Vermont, and is in the Yale University Museum.

Genus **Acheilus**, nov.

Corynexochinae with expanding glabella, straight dorsal furrows, but no brim. Anterior glabellar furrows faint or absent; the other two pairs more prominent but short.

Genotype, *Acheilus marcoui*, sp. nov.

This genus is proposed for small trilobites with no brim, reduced cheeks, and a large prominent glabella which much resembles that of a Corynexochus or Bonnia, but which is shorter and has straight instead of curved sides. The species which is designated as the type is rather common in the boulders at Lévis, and another similar form is present at Highgate Falls. It appears to me that *Amphion*? *matutina* Hall is also referable to this genus, but differs from all others except *Acheilus spicatus* in possessing a nuchal spine.

Acheilus marcoui, sp. nov.

Pl. 13, fig. 15.

Description.—Cranidium small, strongly convex, with narrow fixed cheeks. Glabella large, strongly convex, curved abruptly downward at the front. First glabellar furrows obsolete; second pair short, faint, straight; third pair faint, running inward and then backward nearly or quite to the occipital furrow, isolating nearly quadrangular basal lobes. These furrows are shallow and are not seen on all specimens. Eyes large, situated midway in the length. The course of the facial suture is almost straight forward from the inner angle of the eye to the anterior margin, where it turns inward. It leaves only a narrow flattened fixed cheek along the side of the anterior portion of the glabella. Back of the eyes the suture turns diagonally outward and backward, cutting off small triangular fixed cheeks. The occipital furrow is narrow but deep on both axial and lateral lobes. The nuchal ring is flat, without pustule or spine.

Measurements.—Length of cranidium (holotype) 3.5 mm.; width at palpebral lobes 3.75 mm.; at posterior margin 4.25 mm.; width of glabella at back 2 mm., at front 2.75 mm.

Comparisons.—The general appearance of this trilobite reminds one of *Corynexochus capito* Walcott from the Lower Cambrian of Georgia, Vermont, but it lacks the lip-like brim of that species and the eyes are not so far from the glabella. Most of the other species of Corynexochus have a longer glabella.

Horizon and locality.—A rather common trilobite in some of the boulders of the limestone conglomerate at Lévis, Province of Quebec.

Holotype collected by Jules Marcou, now no. 1734 in the Museum of Comparative Zoölogy.

Acheilus macrops, sp. nov.

Pl. 13, fig. 11.

Description.—Cranidium small, convex, with fixed cheeks reduced to but little more than the palpebral lobes. Glabella large, expanding forward, not high in front. First and second pairs of glabellar furrows short and straight, the first pair very faint and not present on all specimens; third pair deeper than the others, curved backward, but do not join the occipital furrow. Palpebral lobes large, diagonally placed, near the dorsal furrows at the anterior end, extending outward and backward nearly to the occipital furrow. In front of the eye the facial suture runs forward and inward, so that there is almost no fixed cheek beside the anterior part of the glabella. Back of the eye the fixed cheek is small and triangular. Occipital furrow narrow, nuchal ring narrow and convex. No occipital pustule or spine.

Measurements.—A cranidium (the holotype) is 2.25 mm. long and 2.75 mm. wide at the palpebral lobes.

Comparisons.—This species differs from *Acheilus marcoui* in having smaller fixed cheeks, larger palpebral lobes, and in having smaller and less completely isolated basal lobes on the glabella.

Horizon and locality.—A rather rare species in zones 1 and 3 of the Milton at Highgate Falls, Vermont. Type in Yale University Museum.

Acheilus matutinus (Hall).

Amphion ? matutina Hall, 16th Ann. Rept. N. Y. State Cab. Nat. Hist., p. 22, pl. 5A, fig. 6, 1863; Trans. Albany Inst., vol. 5, p. 194, 1867.—Walcott, Smithson. Misc. Coll., vol. 64, no. 3, p. 219, pl. 26, figs. 8, 8a, 1916.

This species is not well known but the form of glabella, position of glabellar furrows, lack of brim and direction of the anterior portion of the facial suture are all as in Acheilus. The palpebral lobe is small, situated rather far from the glabella, and the presence of a nuchal spine distinguishes this from the two previous species.

Horizon and locality.—Lower beds of the Upper Cambrian at Trempealeau, Wisconsin, and the Eau Claire formation at Dresbach, Winona Co., Minnesota.

Acheilus ? blairi (Weller).

Ptychoparia blairi Weller, Pal. New Jersey, vol. 3, p. 116, pl. 1, fig. 10–13, 1902.

This species is referred to Acheilus with some doubt, since the glabella does not expand, but actually, as shown in the figure, contracts forward. The description states that it is parallel-sided. There is, however, very considerable resemblance to *Acheilus marcoui*, although the fixed cheeks are wider both in front of and behind the eyes.

Horizon and locality.—From the Upper Cambrian one-half mile north of Blairstown, New Jersey, where it is associated with Plethopeltis.

Acheilus spicatus, sp. nov.

Pl. 13, fig. 12.

Description.—Cranidium minute, smooth, with a broad-based, sharp nuchal spine. Glabella very broad, expanding toward the front, separated from the cheeks by very narrow and lightly impressed dorsal furrows. There are three pairs of glabellar furrows, all short and but faintly impressed. The nuchal furrow is narrow, and the spine stands at an angle of about 150° with the surface of the glabella. Fixed cheeks narrow at the front, expanding backward, descending in a nearly flat slope from the glabella. Palpebral lobes not well preserved, apparently small.

Measurements.—Length of cranidium, including nuchal spine, 2.5 mm., width at back 2.5 mm.; length of glabella 2 mm., width at back 1.25 mm., at front 2 mm.

Comparisons.—This species differs from all others referred to the genus except *Acheilus matutinus* (Hall) in having a nuchal spine. From that species it is to be distinguished by its much fainter glabellar furrows, of which there are three instead of two pairs.

Horizon and locality.—A single specimen was obtained from zone 2 of the Milton at Highgate Falls, Vermont, and is in the Yale University Museum.

Family Remopleuridae Corda.

Genus Apatokephaloides, nov.

Remopleuridae similar to Apatokephalus, but with smaller eyes, glabella less expanded between the palpebral lobes, and with the facial sutures extending nearly straight forward from the eyes, so that the brim is not greatly extended laterally.

Genotype, *Apatokephaloides clivosus*, sp. nov.

Apatokephaloides clivosus, sp. nov.

Pl. 13, figs. 13, 17.

Description.—Cranidium short and wide, with its portion of the brim but slightly extended laterally. Glabella elongate, depressed-convex, expanded between the eyes. There are two pairs of glabellar furrows, the first joining the dorsal furrows just back of the anterior end of the palpebral lobes, their direction being diagonally backward and inward. They are short but deep. The second pair do not reach the dorsal furrows and are curved depressions which have various shapes in different specimens. The palpebral lobes are long, situated about midway in the head, separated from the glabella by a narrow furrow only. Posterior fixed cheeks large, extending out well beyond the eyes. Occipital furrow narrow, continuous across axial lobe and cheeks. Occipital ring wide, without median pustule. Brim of medium width, nearly flat, with a narrow raised border which usually is broken off. No specimen has been seen showing the row of pits inside

the border which characterizes species of Apatokephalus. The surface is covered with low rounded pustules.

Two imperfect pygidia are referred to this species because of their general resemblance to the pygidia of Apatokephalus. Pygidium wider than long, with four pairs of short, incurved marginal spines. The axial portion of both specimens is too badly preserved to show anything of value. There are at least three rings, and there are very short spines immediately behind the axial lobe. Each pleural lobe has a furrowed rib corresponding to the marginal spine. The surface is thickly covered with low rounded pustules.

Measurements.—Length of cranidium (holotype) 6 mm.; width at palpebral lobes 5 mm., at posterior margin 10 mm.; length of glabella 4 mm., width at axial lobe 3.25 mm. A large pygidium is 7 mm. long and about 22 mm. wide on the anterior margin.

Comparisons.—This species differs from *Apatokephalus finalis* (Walcott, 1884, p. 89, pl. 12, figs. 12, 12a) chiefly in that the facial sutures turn more directly forward in front of the eyes, thus much reducing the amount of the brim pertaining to the cranidium. The row of pits inside the border is also lacking, and the first glabellar furrows are generally obliterated, although one specimen shows a trace of them. The pygidia are much alike.

The type of Apatokephalus, *Apatokephalus serratus* (Sars and Boeck) has one more pair of spines on the pygidium, and a cranidium much like that of *Apatokephalus finalis*. The eyes are much smaller and farther forward in the present species than in either of the others mentioned.

Horizon and locality.—This is a fairly common trilobite in zone 3 of the Milton at Highgate Falls, Vermont. Two cranidia were found in zone 1. Holotype (a cranidium) and paratype (a pygidium) in Yale University Museum.

Apatokephaloides inflatus, sp. nov.

Description.—This species differs from the preceding in having a more convex glabella, narrower brim, and in having the glabellar furrows reduced to two pairs of pits which do not connect with the dorsal furrows. The facial sutures have the same course as in *Apatokephaloides clivosus* and the palpebral lobes are large, sit-

uated adjacent to the dorsal furrows, and about midway in the length.

Measurements.—Length of cranidium of holotype 7 mm., width at posterior margin 7 mm.; length of glabella 5 mm., width at the back 5.5 mm.

Horizon and locality.—A rare species in zones 2 and 3 of the Milton at Highgate Falls, Vermont.

The holotype, a cranidium, is in the Yale University Museum.

Family Asaphidae Salter.

Subfamily *Ogygiocarinae* Raymond.

Niobe ? sp. ind.

A single fairly well-preserved pygidium suggests reference to Niobe, but in the absence of the cranidium a positive identification is not possible. The outline is regularly rounded, the length more than one-half the width, and the surface gently convex. The axial lobe is narrow, less than one-third the total width, moderately convex. The anterior two-thirds of its length shows six rings; the posterior third has been broken away. The pleural lobes have three pairs of short ribs, corresponding with the first three rings on the axial lobe. The greater part of the surface is smooth, and there is a wide concave border.

Measurements.—Length 22 mm.; width about 32 mm.; length of axial lobe 17 mm.; width at front about 7 mm.

Comparisons.—This pygidium is not unlike that of *Niobe morrisi* (Billings), a species found in the Normanskill of Newfoundland. It is not quite so broad, the axial lobe is relatively shorter, and the ribs are neither so long nor so broad, although in both cases there are three pairs.

Niobe has not been found in the American Beekmantown, although it may be discovered at any time, since it is common enough in the Ceratopyge zone in Europe. I do not know any European species with so few and short ribs.

Horizon and locality.—A single pygidium was found in a boulder in a limestone conglomerate in the Georgia formation about five miles north of Highgate Center, Vermont.

Asaphellus obtectus, sp. nov.

Pl. 13, figs. 14, 18.

Description.—Known from pygidia only. Pygidium short and wide, rounded in outline. Axial lobe narrow, less than one-third the total width, not greatly elevated, but surrounded by deep dorsal furrows. There is a single ring behind the anterior half-ring. The pleural lobes are smooth, except for an anterior intramarginal furrow, and slope to a narrow concave margin. The doublure is very narrow.

Associated with the pygidia is a single hypostoma, which is largely the basis for the generic reference. It posterior margin is straight, the lateral and anterior margins gently convex, so that the entire organ is subquadrate. The brim is narrow and concave, the body gently convex, and the maculae small, connected directly with the lateral furrows.

Measurements.—No pygidium is complete, and estimated measurements are indicated by the word "about." The holotype is 16 mm. long and 31 mm. broad; another specimen is 12 mm. long and about 24 mm. wide; the axial lobe is 11.5 mm. long and 5 mm. wide at the front. A larger pygidium is a little more than 18 mm. long. A small one is 9 mm. long, about 18 mm. wide, and the axial lobe is about 4 mm. wide at the front. The hypostoma is 5.5 mm. long and 5 mm. wide.

Comparisons.—The hypostoma found with these pygidia resembles that of *Asaphellus homfrayi* (Salter), the type of the genus, and certainly belongs to a member of the Ogygiocarinae. If it belonged to one of the trilobites whose pygidia occur in the same layers, as it probably did, then the generic reference must be within the subfamily indicated. The short wide form of the pygidium makes it doubtful if the genus is Megalaspis, and the narrow front of the axial lobe indicates Asaphellus rather than Hemigyraspis. If no hypostoma had been found, these pygidia might readily have been identified as Isotelus or Isoteloides. The axial lobe is, however, longer than in any known species of those genera, and the doublure is narrower. The former feature is rather of specific than generic importance, but the width of the doublure is apparently more constant.

Only two other American species of Asaphellus have been described. *Asaphellus gyracanthus* Raymond (1910, p. 39, pl. 14, fig. 5–7) from the Beekmantown (Tribes Hill) of the Mohawk Valley, and the same horizon in New Jersey, has the same outline and narrow doublure as the species here described, but has rings all along the axial lobe. *Asaphellus homfrayi* Matthew, var. (1903, p. 232, pl. 18, fig. 10a–10e) from Cape Breton has an hypostoma and a pygidium almost identical with those of the present species. Matthew's species is, however, not the same as Salter's *Asaphellus homfrayi*, and if the cephalon of the form found in Vermont should prove to be like that of the trilobite from Cape Breton, the name now proposed could be used for specimens from both localities.

Horizon and locality.—Several fragmentary pygidia and one hypostoma were found at the base of the Georgia formation at a locality 0.5 miles south of the Canadian border, 0.5 miles west of Rock River, and about 5 miles north of Highgate Center, Vermont.

Hemigyraspis, sp. ind.

An exceedingly badly preserved thorax and pygidium on the surface of a piece of sheared limestone indicate the presence of some sort of an asaphid in the Highgate limestone. Enough of the outline of the pygidium can be made out to show that it was short and wide, thus suggesting Hemigyraspis, but it is quite impossible to make a positive determination. Seven or possibly eight thoracic segments can be counted, and two of them have diagonal furrows and rounded, blunt terminations as in the Asaphidae. The axial lobe appears to be somewhat more than one-third the total width. Six segments together are about 30 mm. long, and the width at the middle of the thorax would seem to have been about 60 mm. It is impossible to get any accurate measurements of the pygidium, somewhat less than half of which is preserved in a much flattened condition, but one may judge that it had been about 60 mm. wide and 35 mm. long.

Horizon and locality.—This specimen was found associated with *Pilekia extenuata* and *Leiostegium puteatum* in the Highgate limestone two miles north of Highgate Center, Vermont.

Family Stygınidae Raymond.

Genus **Leptopilus**, nov.

Cephalon strongly convex, narrow, without depressed border. Glabella short, parallel-sided. Eyes large, far back, and close to the dorsal furrows.

Genotype, *Leptopilus declivis*, sp. nov.

This genus is erected for a little trilobite which much resembles an agnostid, but which bears large eyes far back and close to the dorsal furrows. The facial sutures are those of Stygina, hence the species is tentatively placed in the family with it. The very short parallel-sided glabella is not, however, at all like the long, expanding one of Stygina or Holometopus.

Leptopilus declivis, sp. nov.

Pl. 13, fig. 20.

Description.—Cephalon narrow, convex, agnostiform, without marginal furrow or elevated border. Glabella short, about half the whole length, narrow, apparently without furrows. Dorsal furrows narrow, becoming shallow forward, and joining in front of the glabella. The occipital furrow is narrow, rather deep, and extends half-way down the sides. Eyes large, situated far back and near the dorsal furrows; an ocular ridge runs forward from each to near the front of the glabella. Free cheeks wide, standing at a high angle on the convex sides of the cephalon. Each bears a short acute genal spine.

In front of the eyes the facial sutures turn outward down the slope of the cheeks, then converge again, being very close to the margin in the later part of their course, and meeting at an obtuse angle in the middle of the front. Back of the eyes they turn directly outward till they reach a point half-way down the slope of the cheeks, then turn abruptly back to the margin. Surface smooth.

Measurements.—The cephalon (holotype) is 5 mm. long, 2.75 mm. wide at the palpebral lobes, and 5.25 mm. wide at the posterior margin. The glabella plus the nuchal segment is 3 mm. long, and 1.5 mm. wide. Each eye is about 1.5 mm. long.

Comparisons.—The surface of this specimen is somewhat weathered, so that neither the eyes nor the sutures show distinctly.

It has, therefore, very much the same appearance as *Idiomesus tantillus*, and might also be mistaken for an agnostid. The most nearly allied species of which I am cognizant is *Holometopus angelini* Billings, a small trilobite which was described from "Limestone No. 2" at Lévis. The glabella is, however, much shorter than that of *Holometopus angelini*, and the whole cephalon is narrower. *Holometopus limbatus* Angelin, the type of the genus, has a still longer glabella.

Horizon and locality.—A single cephalon now in the Yale University Museum, was found in the lower part of the Highgate limestone north of Highgate, Vermont.

Family Dikelocephalidae Miller.

Subfamily *Dikelocephalinae* Beecher (emend. Walcott).

Walcott (1914, p. 346) has discussed the American species of this branch of the Dikelocephalidae, and proposed a number of new genera. Dikelocephalus Owen (emend. Walcott) "appears to be distinct from all other genera by the broad flattened border of its cephalon, large eyes placed well back, large, broad subquadrangular glabella with posterior furrow, and large wide pygidium with broad flattened border." Genotype, *Dikelocephalus minnesotensis* Owen.

Saukia Walcott "has a narrow frontal border about the cephalon and a glabella proportionately more elongate than in Dikelocephalus. The pygidium of Saukia is less expanded and proportionately more elongate than that of Dikelocephalus." Genotype, *Dikelocephalus lodensis* Whitfield.

Conokephalina Broegger "has a somewhat similar form to that of Saukia, but the strong transverse posterior glabellar furrow of Saukia, and the absence of a clearly marked frontal limb in advance of the glabella serve to distinguish the cranidium of Saukia. The pygidium associated with *Conokephalina ornata* is transverse with a spinose margin, while that of Saukia is nearly as long as broad, and the margin is unbroken by spines." Genotype, *Conokephalina ornata* Broegger.

Osceolia Walcott "is characterized by its concave limb, elongated palpebral lobes; narrow fixed cheeks and transverse pygidium with its anterior segment extended beyond the margin as a

[pair of] long strong spine[s]." Genotype, *Dikelocephalus osceola* Hall.

Calvinella Walcott "is most like Saukia, from which it differs in form of glabella, presence of a strong occipital spine, and proportionately more elongate pygidium." Genotype, *Dikelocephalus spiniger* Hall.

Omitting Conokephalina, which as will be shown, is probably not known in the American Upper Cambrian fauna, the remaining four genera may be divided into two groups, each with two genera.

Dikelocephalus and Osceolia both have a wide concave or flat border in front of the glabella; Saukia and Calvinella have only a narrow furrow and elevated border at the front. The types of Dikelocephalus and Osceolia have one pair of marginal spines on the pygidium, which is broad. Saukia and Calvinella have narrow pygidia with smooth margins. Dikelocephalus has a shorter glabella than Osceolia and usually is of greater size. Calvinella is essentially a Saukia with a long occipital spine.

Conokephalina was based on *Conocephalites ornatus* Broegger, a small trilobite from the Middle Cambrian at Krekling, Norway. Walcott has agreed provisionally with Broegger in referring *Dikelocephalus misa* Hall to this genus and has also suggested that *Dikelocephalus inexpectans* Walcott, *Dikelocephalus cristatus* Billings, *Dikelocephalus iole* Walcott, and *Dikelocephalus megalops* Billings may be placed in it. He has also described a new species as *Conokephalina whitehallensis*.

The chief peculiarity of *Conokephalina ornata* as a dikelocephalinid, is that the posterior glabellar furrows do not unite at the median line ("sulcis utrinque 3, posterioribus obliquis, anterioribus sulco occipitali parallelis," Broegger) but are strongly oblique. The wide pygidium has three pairs of short spines.

Dikelocephalus misa Hall has the posterior furrows joined to form a deep cross-furrow, and the pygidium usually attributed to it is spineless. It seems that the species is much more closely allied to Saukia than to Conokephalina, and in fact, I would not know by what characteristics it could be separated from the former genus. It has, it is true, one peculiar feature, which is a narrow furrow parallel to the front of the anterior part of the circum-glabellar furrow, dividing the brim into two narrow ridges. Otherwise it is a quite typical Saukia.

Dikelocephalus megalops Billings (1865, p. 403, fig. 380) also has a continuous furrow across the posterior part of the glabella and so cannot be a Conokephalina. It is made the type of a new genus on a later page of this work.

Dikelocephalus inexpectans Walcott (1884, p. 90, pl. 1, fig. 10) is based on a small cranidium from the lowest Ordovician. It agrees with Conokephalina in that the eyes are large and near the dorsal furrows, but shows no other characteristics of the Dikelocephalinae. There are only two pairs of slightly indented furrows, and the sutures pursue a totally different course from those of Conokephalina, turning outward and meeting the margin on a line drawn across the anterior ends of the eyes. The sutures alone would exclude the trilobite from this subfamily.

Dikelocephalus iole Walcott, which is referred only doubtfully to Conokephalina, is a small trilobite which may belong to the Dikelocephalidae, but is excluded from Conokephalina by the fact that the two pairs of glabellar furrows do not reach the dorsal furrows. This species and *Dikelocephalus cristatus* are discussed on a later page under a new generic name.

Conokephalina whitehallensis Walcott (1912, p. 269, pl. 44, fig. 9–11a) is remarkably similar to *Conokephalina ornata*, but the associated pygidium lacks marginal spines. The cranidium is very similar to that of young specimens of *Saukia misa*, but the pygidium is not of that genus, and is much more like that of a Ptychoparia. The proper generic allocation awaits fuller knowledge of the species.

Genus **Dikelocephalus** Owen.

Dikelocephalus insolitus, sp. nov.

Pl. 13, fig. 22.

Walcott states in regard to the genus Dikelocephalus: "It does not occur in the St. Lawrence Valley of Canada, but fragments of what may be a species of the genus occur in the Champlain Valley in Franklin County, northwestern Vermont, both in the Upper Cambrian limestone (one mile southwest of Highgate Falls) and the superjacent limestone conglomerate." Professors Schuchert and Dunbar likewise found fragments which are probably referable to Dikelocephalus, but among them only a pair of hypos-

tomata are sufficiently well preserved to be of any value. Ordinarily I should not give a name to a species based upon the hypostoma only, but since it is unlikely that the shield can be definitely associated with a dorsal test in the early future, it will be convenient to have a name for this elusive species.

Very little is known of the hypostomata of dikelocephalids. Hall figured three fragmentary ones of *Dikelocephalus minnesotensis* and one of *Saukia pepinensis* (1863, pl. 9, figs. 4, 9, 10; pl. 11, fig. 1). Walcott also figured three of *Dikelocephalus minnesotensis* (1914, pl. 61, figs. 3, 7; pl. 62, fig. 5) and one of *Dikelocephalus harti* (1912, pl. 44, fig. 4). Hall gives the following description of the hypostoma of *Dikelocephalus minnesotensis:* "Hypostoma broad; the body convex and subcircular or very broadly oval, with margins expanded and furrowed near their antero-lateral angles. In small specimens, there is a minute node near each anterior angle." In reading this, the terms anterior and posterior should be reversed.

Combining the information afforded by Hall's and Walcott's figures, it appears that the hypostoma of *Dikelocephalus minnesotensis* is roughly rectangular, wider than long, the posterior border with a broad shallow median emargination. The body is approximately circular with rather deep lateral furrows, the maculae convex, circular or oval, with diagonal furrows between them and the body. The anterior end has a flattened border.

Description.—The hypostoma of *Dikelocephalus insolitus* is approximately square, with rounded angles, and a straight instead of emarginate posterior outline. The body is oval, the maculae elongate, narrow, obliquely placed, standing above a broad flat posterior brim. The surface is covered with sharp, irregular striae which are more or less parallel to the margins.

Measurements.—Length 12.5 mm.; greatest width 13.5 mm. The larger specimen is 14 mm. long and 15 mm. wide.

Comparisons.—It would appear that the hypostoma of Dikelocephalus much resembles that of Niobe among the Asaphidae, but is much less deeply emarginate than that of most of the species of that genus. The hypostoma of *Saukia pepinensis* is quite different from that of either of the species of Dikelocephalus. Instead of being wider than long it is longer than wide, the pos-

terior margin is curved outward, instead of being straight or emarginate and there is no flat brim, but a narrow, wire-like, elevated border. A specimen in the Museum of Comparative Zoölogy is 8 mm. long and 7 mm. in greatest width—except at anterior margin—(see Pl. 13, fig. 21). If the hypostomata of other species of Saukia are of this same type, there is additional reason to separate the genus from Dikelocephalus.

As noted above, the hypostoma of *Dikelocephalus harti* is known, and it is very like that of *Saukia pepinensis*. Is *Dikelocephalus harti* a real Dikelocephalus? According to Walcott, Dikelocephalus is to be restricted to those species having a relatively short glabella and a concave or flat brim. *Dikelocephalus harti* has a long glabella and a convex brim. The cephalon and pygidium of Dikelocephalus are short and broad, those of Saukia long and narrow. The cephalon and pygidium of *Dikelocephalus harti* have proportions much more nearly like those of *Saukia lodensis* than those of *Dikelocephalus minnesotensis*. In fact, *Dikelocephalus harti* is exceedingly like *Saukia crassimarginata* in proportions and many other characteristics. It is therefore much more likely that *Dikelocephalus harti* is a Saukia than that two kinds of hypostomata are found within the genus Dikelocephalus.

Horizon and locality.—*Dikelocephalus insolitus* is so far known only from zone 1 of the Milton at Highgate Falls, Vermont, and the type is in the Yale University Museum.

Genus Saukia Walcott.

Saukia lodensis (Whitfield).

Dikelocephalus lodensis Whitfield, Ann. Rept. Wisconsin Geol. Survey for 1879, p. 51, 1880; Geol. Wisconsin, vol. 4, p. 188, pl. 10, fig. 14; p. 341, pl. 27, fig. 12, 13, 1882.—Chamberlin, Geol. Wisconsin, vol. 1, p. 130, text-figs. 16, 16a, b, 1883.

Saukia lodensis Walcott, Smithson. Misc. Coll., vol. 57, pp. 373, 379, pl. 65, fig. 1–3, 1914.

A single partially preserved cranidium appears to represent this species. About two-thirds of the glabella, anterior border, and the neck-ring are preserved. All these parts are covered with fine pustules. There are two pairs of glabellar furrows, the

second pair uniting to form a complete cross-furrow, the first pair separated by only a short interval. Both pairs turn backward where they leave the dorsal furrows, then become parallel to the neck-furrow, as in *Saukia lodensis*. The form differs from good specimens of that species chiefly in that the frontal border is not so much depressed below the level of the top of the glabella. This may of course be due to distortion.

The pustulose surface of this specimen suggests *Ptychaspis speciosa* (Walcott). The glabella is not, however, so convex as in that species nor are the anterior glabellar furrows so distinct; the anterior border particularly is not turned downward as in Ptychaspis.

Measurements.—Length of cranidium 12 mm.; width of glabella at back about 10 mm., at front about 8 mm.

Horizon and locality.—Found in zone 3 of the Milton at Highgate Falls, Vermont. The species is characteristic of the St. Lawrence formation in Wisconsin.

Saukia stosei Walcott.

Saukia stosei Walcott, Smithson. Misc. Coll., vol. 57, no. 13, p. 384, pl. 69, fig. 3–5; pl. 70, figs. 12, 12a, 1914.

Two imperfect cranidia seem to represent this species, the only difference noted being that the eye appears to be slightly nearer the dorsal furrows in the specimens from Vermont than in the originals. The glabella is evenly convex, tapers a little forward, and has three pairs of furrows, the third pair continuous, the two others not united at the inner ends. A narrow concave brim separates the front of the glabella from a very narrow elevated border. What fragments of test remain have a granulose and punctate surface.

Measurements.—Length of cranidium 12 mm.; width at palpebral lobes about 14 mm.; width of glabella at back 9.5 mm., at front 8 mm.

Comparisons.—*Saukia stosei* is chiefly characterized by the combination of a glabella retaining all three pairs of glabellar furrows with a narrow concave brim edged by a very narrow convex border. Most of the species of this genus have the border wider than the furrow,—in this one the reverse obtains.

Horizon and locality.—The original locality for this species was in the Conococheague limestone (near top of Upper Cambrian), northwest of Scotland Station, Franklin Co., Pennsylvania. Two cranidia were found in zone 3 of the Milton at Highgate Falls, Vermont.

Saukia dunbari, sp. nov.

Pl. 14, fig. 7.

Description.—This species is represented by an incomplete cranidium only. The glabella is large, evenly convex and tapers rapidly toward the front. The posterior glabellar furrows are deep and continuous across the glabella, nearly parallel to occipital furrow. The second pair are lightly impressed, but distinct, each extending about one-third the way across the glabella, nearly parallel to the third pair. The first pair are very faint, but nearly as long as the second. Their course is parallel to the occipital furrow.

The dorsal furrows are shallow, and rather narrow, especially at the front. The palpebral lobes are also narrow, situated close to the dorsal furrows. Most of the brim is broken away, but there appears to have been a narrow convex border at the front of the cranidium. The occipital segment is wide and convex. The surface is granulose.

Measurements.—Length of cranidium (incomplete at front) 17 mm.; width at palpebral lobes 18 mm.; length of glabella 12.5 mm., width at occipital furrow 13 mm., width at front 9.5 mm.; length of palpebral lobe 5 mm.

Comparisons.—The shape of the glabella of this species suggests *Saukia misa* (Hall) but the eyes are farther forward, and it lacks the peculiar doubly ridged brim of that species. *Dikelocephalus megalops* (Billings) is also suggested, but apparently the rim was separated from the front of the glabella by a narrow furrow only. Comparison may also be made with *Saukia marica* Walcott, that species having, however, the eyes much farther from the dorsal furrows.

Horizon and locality.—A single cranidium was collected from zone 3 of the Milton at Highgate Falls, Vermont, and is in the Yale University Museum.

Subfamily *Richardsonellinae*, nov.

Genus **Richardsonella**, nov.

Among the species of "Dikelocephalus" described by Billings from the boulders at Lévis are three, *Dikelocephalus oweni*, *D. megalops*, and *D. cristatus*, which have more or less similarity to the genus to which they were assigned, but differ from it in one important particular. The course of the suture, in front of the eyes, is not first outward and then inward, but continues outward directly to the margin. As a result, that portion of the brim which belongs to the cranidium has angular instead of rounded lateral margins. Besides this feature, in which they differ from all other Dikelocephalinae, these three species have, just inside the elevated border of the brim, a row of more or less conspicuous pits.

These species show a remarkable diversity in glabellar furrows. *Dikelocephalus megalops* has the typical furrows of the Dikelocephalinae, *D. oweni* has the furrows almost obliterated but such depressions as remain suggest the pattern of *D. megalops*, whereas *D. cristatus* has absolutely no trace of glabellar furrows.

Walcott (1914, p. 350–352) has referred *Dikelocephalus megalops* to Conokephalina, *D. cristatus* with doubt to Conokephalina, and *D. oweni* provisionally to Anomocarella. The course of the facial suture in front of the eye shows that none of these species belongs to either genus. On the other hand, the general form and the peculiar row of depressions show that the three species belong to one group, and the glabellar furrows of *Dikelocephalus megalops* indicate that group to be the Dikelocephalidae. It is, therefore, necessary to erect a new genus, which I proposed to call Richardsonella, in remembrance of Mr. James Richardson's excellent work on the "Quebec Group."

As genotype, *Dikelocephalus megalops* Billings may be selected.

Richardsonella megalops (Billings).

Dikelocephalus megalops Billings, Canadian Nat. and Geol., vol. 5, p. 311, fig. 9, 1860; Geol. Canada, p. 236, fig. 257, 1863; Pal. Foss. Canada, p. 403, fig. 380, 1865.—Matthew, Trans. Roy. Soc. Canada, vol. 10, sec. 4, p. 11, footnote, 1893.

This species has a glabella of the form typical of Saukia, three pairs of glabellar furrows, the hinder pair of which are continuous with one another, very large eyes close to the dorsal furrows, and

a narrow convex border on a rather narrow brim. Were it not for the course of the facial sutures, the pits inside the border, and the striations on the brim, one would consider this a typical Saukia.

Horizon and locality.—This species has been found only in the boulders in the limestone conglomerate at Lévis, Province of Quebec.

Richardsonella tribulis (Walcott).

Dikelocephalus tribulis Walcott, Smithson. Misc. Coll., vol. 57, no. 9, p. 274, pl. 44, figs. 8, 8a, 1912; *ibidem*, no. 13, p. 378, pl. 63, figs. 8–10, 10a, 1914.

I have not seen a specimen of this species, but the photographic figure shows a brim with the striations and pits characteristic of Richardsonella. The glabella has a continuous posterior furrow, and one pair which do not meet at the inner ends. The specimen is too incomplete to show the course of the facial suture.

Horizon and locality.—A rare species in the Hoyt limestone, 4 miles west of Saratoga, New York.

Richardsonella oweni (Billings).

Dikelocephalus oweni Billings, Canadian Nat. and Geol., vol. 5, p. 310, fig. 8, 1860; Geol. Canada, p. 236, fig. 259, 1863; Pal. Foss. Canada, vol. 1, p. 402, fig. 379, 1865.—Matthew, Trans. Roy. Soc. Canada, vol. 10, sec. 4, p. 11, footnote, 1893.

A cranidium collected by Jules Marcou at Lévis retains one palpebral lobe, and so adds a little to what has previously been known of this species. The glabellar furrows shown in Billings' figure of the type are evidently much accentuated, as Billings states that there are from "two to four obscure depressions on each side, representing the glabellar furrows." The specimen at hand shows traces of two pairs of furrows, somewhat like those of *Richardsonella germana*, but the glabella is almost smooth. The occipital furrow is shallow, but distinct.

Measurements.—Length of cranidium 18 mm., width at palpebral lobes about 15 mm.; distance from posterior margin to front of glabella 13.5 mm.; width of glabella at back 10.5 mm., at front 9.5 mm.

Horizon and locality.—The only specimens so far collected have been found in pebbles of the limestone conglomerate at Lévis, Province of Quebec.

Richardsonella germana, sp. nov.

Pl. 14, fig. 3.

Description.—Known from an imperfect cranidium only. Cranidium short, depressed-convex, the front an arc of a circle of large radius.

Glabella gently and evenly convex, expanding slightly toward the front, the sides nearly parallel. The occipital furrow is faint, as are the two pairs of glabellar furrows. These are peculiar, as the outer ends do not reach the dorsal furrows, but the inner ends are united, so that they produce a pair of bow-shaped depressions, concave forward. The second pair almost reach the dorsal furrows. The brim is narrow, with a raised border as wide as the concave portion behind it. The pits inside the border are very small, and no striations are present. The palpebral lobes are not well preserved, but appear to be large and close to the narrow dorsal furrows. The specimen retains the test, which is smooth, except for irregular, fine striations on the border.

Measurements.—The cranidium of the holotype is 12.5 mm. long, and about the same in width at the palpebral lobes. The glabella plus the occipital ring is 10 mm. long.

Comparisons.—This species is perhaps most closely allied to *Richardsonella belli* (Billings) but has a narrow brim, smaller pits, a more nearly rectangular glabella, and more continuous although equally faint glabellar furrows.

Dikelocephalus iole Walcott (1884, p. 43, pl. 10, fig. 19) has a glabella which strongly resembles that of *Richardsonella germana*.

Horizon and locality.—A single cranidium was collected in zone 3 of the Milton at Highgate Falls, Vermont, and is in the Yale University Museum.

Richardsonella cristata (Billings).

Dikelocephalus cristatus Billings, Canadian Nat. and Geol., vol. 5, p. 236, fig. 258, 1860; Pal. Foss. Canada, vol. 1, p. 404, fig. 381, 1865.—Matthew, Trans. Roy. Soc. Canada, vol. 10, sect. 4, p. 11, footnote, 1893.

This species is chiefly remarkable for the complete obliteration of the glabellar furrows. A small cranidium in the Museum of Comparative Zoölogy is of interest because it shows the facial

sutures and the brim to be of the same form as those of *Richardsonella oweni*.

Horizon and locality.—This trilobite has so far been found in the pebbles of the conglomerate at Lévis only.

Richardsonella iole (Walcott).

Dikelocephalus iole Walcott, Pal. Eureka Dist., p. 43, pl. 10, fig. 19, 1884.

A single cranidium from Vermont appears to belong to this species, although there are minor differences. The glabella is moderately convex, nearly parallel-sided, and has two pairs of very faintly impressed glabellar furrows which do not connect with the dorsal furrows. A narrow furrow separates the front of the glabella from the rim, which is nearly flat. The palpebral lobes are large, slightly farther from the glabella than those of Walcott's original specimen.

Measurements.—The cranidium is 6.5 mm. long; the glabella is 4.5 mm. long and 3.5 mm. broad at the back.

Horizon and locality.—The single specimen was found in zone 1 of the Milton at Highgate Falls, Vermont. The original of the species was found in the upper part of the Prospect Mountain group in the Eureka district, Nevada.

Subfamily *Hungaiinae*, nov.

Genus **Hungaia** Walcott.

Hungaia Walcott, Smithson. Misc. Coll., vol. 57, no. 13, p. 351, 1914 (name published, with a reference to a published description and figure).

The name of this genus has been published, and since but one species, *Dikelocephalus magnificus* Billings (1865, p. 400, fig. 376) has been assigned to it, no description has been necessary.

Hungaia magnifica is a remarkable trilobite, the cranidium of which is very much like that of Dikelocephalus, except for its vestigial furrows. The pygidium, however, ends in four pairs of short flat spines, and is, superficially at least, quite unlike that of Dikelocephalus. *Dikelocephalus minnesotensis* and Osceolia, however, each have one pair of flat spines on the pygidium. Dikelocephalus, it is true, has numerous pairs of ribs on the pleural lobes, but Osceolia shows only three, one less than in Hungaia.

Since the cranidium is very like that of the Dikelocephalidae, and the pygidium is not such as to prevent reference to that

family, it seems that it is best to place the form there. It cannot, however, be placed in the same subfamily with any of the other genera, and it is necessary to erect for it a new one, the Hungaiinae, which shall contain dikelocephalids with short glabella and broad concave or flat brim, and a pygidium with no rim and the ribs ending in flat spines.

Hungaia magnifica (Billings).

Dikelocephalus magnificus Billings, Canadian Nat. and Geol., vol. 5, p. 307, fig. 5, 1860; Geol. Canada, p. 235, figs. 255a, b, 1863; Pal. Foss. Canada, vol. 1, p. 399, fig. 376, 1865.—Matthew, Trans. Roy. Soc. Canada, vol. 10, sec. 4, p. 11, 1893.—Frech, Lethaea Geog., Pal., vol. 2, pl. 16, figs. 18a, b, 1897.

Apatokephalus magnificus Broegger, Nyt Mag. f. Naturvid., vol. 36, p. 175, fig. 10, p. 184, 1897.

This species is too well known to need redescription, but it should be pointed out that the radial ridges which cross the brim are not so prominent on specimens as the figure would indicate, and that the glabella is proportionately longer and narrower. There is also a rather prominent tubercle on the median line, just in front of the neck-furrow.

The pygidium was incorrectly described and figured by Billings, as there are four instead of three pairs of spines, the inner short ones being left off from Billings' figure, although their presence on the specimen is indicated by the breaks in the smooth curve of the outline of the region between the inner pair of spines there shown.

Horizon and locality.—This is a rather common species in the pebbles of the conglomerate at Lévis, but has not yet been found elsewhere.

Hungaia minuta, sp. nov.

Pl. 14, fig. 1.

Description.—Pygidium small, short, depressed, except on the median line. Axial lobe short, convex, standing high above the remainder of the pygidium. It has one prominent and one faintly marked ring, and at the crest of the posterior end, a pair of large, smooth tubercles placed close to each other on either side of the median line. Each pleural lobe consists of four ribs, each ending in a flat spine. A narrow groove extends down the median line of each rib, out on to the spine, and at the line of junction of

each adjacent pair of ribs there is a low ridge parallel to the furrows. On the median line of the pygidium there is a strongly marked rib which extends to the apex of the re-entrant angle formed by the inner pair of spines.

Measurements.—The pygidium (holotype) is 2.75 mm. long and 4 mm. wide; the axial lobe is 1.50 mm. long and 1.25 mm. wide at the front.

Comparisons.—This pygidium is like that of *Hungaia magnifica* in having a spinose posterior margin, in having each rib furrowed and bounded by a ridge, and in the presence of a median rib behind the axial lobe. It differs, however, in being shorter, and in having fewer rings, a pair of pustules on the axial lobe, and in the outline of the entire pygidium. It may be, that when better known, the species must be removed from Hungaia, but in the absence of knowledge of the cephalon, it is better not to establish a new genus at present.

The pygidium assigned to *Dikelocephalus corax* by Billings is smaller than that of *Hungaia magnifica*, but has the same sort of axial lobe as that species, and so is rather unlike *Hungaia minuta*.

Horizon and locality.—A single pygidium was found in zone 2 of the Milton at Highgate Falls, Vermont, and is now in the Yale University Museum.

Subfamily *Illaenurinae*, nov.

The cranidium of *Illaenurus quadratus*, as it was known before 1916, was so much like that of Symphysurus that in previous papers I have referred this genus to the Asaphidae, whereas most other writers have considered it a member of the Illaenidae. Dr. Walcott has now figured some very well-preserved specimens which throw a new light on the subject and show that there is certainly no relationship to Symphysurus or to the Asaphidae. As with other smooth trilobites, the affinities of this animal are not obvious. It is true that it resembles an illaenid, but has one more than the typical number of thoracic segments (10) found in that family. The individual segments are Illaenus-like in their smoothness. One of the more commonly used criteria for distinguishing Asaphidae from Illaenidae is the fact that each pleuron of a thoracic segment of a member of the former family has a

diagonal furrow, whereas the pleura of the latter are smooth. The figures published by Dr. Walcott (1916, pl. 45) are somewhat perplexing, for on that basis fig. 1 belongs to the Illaenidae, and fig. 1b to the Asaphidae. Specimens in the Museum of Comparative Zoölogy show the pleuron to be almost smooth, and it has the appearance of coming to a spine-like termination, because the anterior corner is turned down in the outer half. There is a suggestion of a furrow which turns back to the posterior outer angle.

Although so illaenid-like, there is one strikingly discordant feature, and that is the position of the eyes. Dorsal furrows are absent from the cephalon, but if the furrows of the thorax be projected on to the head, it will be seen that the palpebral lobes border the dorsal furrows, which is not the case in the Illaenidae. The position of the eyes shows that this is not a primitive, but a specialized trilobite, an indication confirmed by the very wide axial lobe, and unfurrowed cephalon and pygidium. Such a form could not have given rise to species with narrow axial lobes and eyes distant from the glabella. Being a highly specialized form, this trilobite must have occupied a terminal position on some line, and can therefore not be an illaenid. As will be shown in the description of a new species of Illaenurus, I am inclined to think this is one of the lines of dikelocephalid evolution, and I propose a new subfamily which will, at the present time, contain two described genera, Illaenurus and Platycolpus, and one new one.

Description.—The new subfamily may be described as follows: derived Dikelocephalidae, in which the glabella reaches the anterior border, all dorsal and glabellar furrows are reduced or obsolete, and with a pygidium without rings or ribs, sometimes without differentiated axial lobe. Axial lobe of thorax of medium or great width. Number of thoracic segments in the typical genus, eleven.

Illaenurus quadratus Hall.

Illaenurus quadratus Hall, 16th Ann. Rept. N. Y. State Cab. Nat. Hist., p. 176, pl. 7, fig. 52–57, 1863; Trans. Albany Institute, vol. 5, p. 168, pl. 2, fig. 52–57, 1867.—Chamberlin, Geol. Wisc., vol. 1, p. 130, fig. 16L–P, 1883.—Raymond, Ann. Carnegie Mus., vol. 7, p. 43, fig. 9, 1910.—Walcott, Smithson. Misc. Coll., vol. 64, p. 406, pl. 45, figs. 1, 1a–1e, 1916.

One specimen from Vermont appears to belong to this species. The curvature is the same as in individuals from Wisconsin, and

much less than in *Illaenurus breviceps*. There are no dorsal furrows and the sides of the cranidium in front of the eyes are nearly parallel; an apparent slight convergence may be due to the state of preservation.

Measurements.—Length of cranidium 16 mm., width at the palpebral lobes about 18 mm.

Horizon and locality.—The single specimen is from zone 3 of the Milton at Highgate Falls, Vermont. In the typical region in Wisconsin and Minnesota it is a rather common fossil in the St. Lawrence formation of the Upper Cambrian.

Illaenurus breviceps, sp. nov.

Pl. 14, fig. 2.

Description.—Cranidium short, abruptly deflected toward the front, so as to suggest that the whole cranidium had approximately the shape of the surface of a quarter of a sphere. The glabella, which is evenly convex, occupies the greater part of the cranidium. It is outlined laterally by parallel shallow dorsal furrows, and in front is separated from a very narrow raised border by a shallow linear depression. There are no traces of glabellar furrows, or of an occipital furrow on the axial lobe. In front of the eyes there are no fixed cheeks, but the lobes behind them extend far outward and turn downward. Each bears a narrow depression, showing that the occipital furrow is not entirely obsolete. The palpebral lobes are large, flat, and situated about their own length in front of the posterior margin.

The pygidium is short, wide, rather strongly convex, the position of the axial lobe indicated only by a slight depression on either side on the anterior margin. The surface is smooth.

Measurements.—A cranidium, the holotype, is 9 mm. long, 12 mm. broad at the palpebral lobes, and about 20 mm. wide at the posterior margin. A smaller cranidium is 5.25 mm. long, 6 mm. wide at the palpebral lobes, and about 8 mm. at the posterior margin.

A pygidium (paratype) is 3.25 mm. long, and 7 mm. wide.

Comparisons.—This species is closely allied to *Illaenurus quadratus* Hall, differing from it in the profile, which is somewhat more

curved and in having the glabella definitely although faintly outlined by the dorsal furrows. It is also much like *Platycolpus barabuensis* (Whitfield, 1882, p. 201, pl. 4, fig. 6) but has a more curved profile and a more nearly rectangular glabella, the dorsal furrows being parallel in *Illaenurus breviceps*, whereas they converge forward in *Platycolpus barabuensis*. *Illaenurus breviceps* thus forms a connecting link between Illaenurus and Platycolpus and, since *Platycolpus eatoni* Whitfield apparently connects Platycolpus with the Dikelocephalidae, brings Illaenurus into that family as a terminal "smoothed-out" representative.

Horizon and locality.—A rare species in zone 3 of the Milton at Highgate Falls, Vermont. Type in Yale University Museum.

Illaenurus laevis, sp. nov.

Pl. 14, fig. 4.

Description.—Cranidium small, almost hemispherical, with large palpebral lobes. Glabella large, with no furrows other than slight depressions at the posterior margin. At the front it is separated from a wide, striated vertical border by a narrow V-shaped furrow. The palpebral lobes are large, centrally situated. The facial sutures turn slightly inward in front of the eyes and cross the striated border. Behind the eyes their course is outward and backward, leaving small, smooth fixed cheeks. Except for the anterior border, the surface is smooth.

Measurements.—The cranidium (holotype) is 5 mm. long, 6 mm. wide at the palpebral lobes, and about 8 mm. wide on the posterior margin.

Comparisons.—This name is proposed for a small trilobite with a smooth, almost hemispherical head, without dorsal, glabellar or occipital furrows, large eyes, and an anterior, vertical, striated border. This last is almost exactly like that of *Platycolpus capax* and *Platycolpus eatoni*, and furnishes the only clue to the family relationship of the species. The specimen was first identified as a Symphysurus, but it lacks the dorsal furrows and the outward bend of the facial suture in front of eye shown in that genus. Illaenurus may claim the species, for the present, in spite of the peculiar anterior border. A minor difference is that the fixed

cheeks are not so extended in this trilobite and lack furrows, thus agreeing with Symphysurus.

Horizon and locality.—A rare species in zone 3 of the Milton at Highgate Falls, Vermont. Type in the Yale University Museum.

Genus **Platycolpus** Raymond.

Platycolpus dubius (Billings).

Bathyurus dubius Billings, Canadian Nat. and Geol., vol. 5, p. 319, fig. 21, 1860; Pal. Foss. Canada, vol. 1, p. 410, fig. 390, 1863.

Platycolpus dubius Raymond, Bull. Victoria Mem. Museum, vol. 1, p. 64, 1913.

Two imperfect cranidia of this species in the collection furnish the additional information that when not exfoliated, the surface is rather sparsely covered with small, low, smooth granules or pustules. Each shows faint traces of two pairs of glabellar furrows. It should be noted that when perfect, the palpebral lobes are not so long and narrow as shown by Billings' figure. One specimen has one of these very narrow lobes on one side, and a somewhat wider one on the other. The narrower one is obviously imperfect.

Measurements.—The better-preserved cranidium is 10 mm. long and 10.5 mm. wide at the palpebral lobes; the glabella, excluding the occipital segment, is 8 mm. long, 7.75 mm. wide at the back, and 6 mm. wide at the front.

Horizon and locality.—A rare species in zone 3 of the Milton at Highgate Falls, Vermont. The original specimens were from boulders in the limestone conglomerate at Lévis, Province of Quebec.

Genus **Cholopilus**, nov.

Illaenurinae with large eyes, deeply incised dorsal and nuchal furrows, and small fixed cheeks.

Genotype, *Cholopilus vermontanus*, sp. nov.

This generic name is proposed for a small trilobite which much resembles Leiostegium, but has large eyes. The general appearance is that of Symphysurus, but the well-developed nuchal furrow and ring, and absence of median pustule exclude it from that genus. It is probably most nearly related to Platycolpus, but

has larger eyes, smaller fixed cheeks, and a more nearly square glabella than any species of that genus.

Cholopilus vermontanus, sp. nov.

Pl. 14, figs. 8, 11, 15.

Description.—Cranidium short, subrectangular, moderately convex. Glabella nearly square, evenly curved, separated from a narrow elevated frontal border by a linear furrow. Dorsal furrows narrow but deep, parallel throughout their entire extent. Nuchal furrow narrow and deep across both glabella and cheeks; nuchal segment narrow and convex, without median pustule or spine. Palpebral lobes large, extending back nearly to the nuchal furrow, and forward more than half-way to the front. The anterior and posterior ends of each lobe are separated from the dorsal furrow by a narrow slightly convex ridge. The fixed cheeks behind the eyes are small and do not extend far laterally. The entire surface of the cranidium is covered with small, low pustules or granules which are only visible under a lens.

A free cheek which very probably belongs to this species has a moderately convex surface, with a narrow elevated border separated from the main portion by a shallow groove. The genal angle is obtusely rounded.

The associated pygidium is evenly convex, the axial lobe about one-third the total width, limited by sharp furrows, and extending nearly to the posterior margin. Three rings are present at the anterior end, sharply defined on the cast, but somewhat more smooth where the test is not removed. The pleural lobes are smooth except for the groove on each limiting the anterior half-segment, and there is no convex or concave border.

Measurements.—A cranidium (holotype) is 3.75 mm. long, 3.00 mm. wide at the palpebral lobes, and 4.50 mm. at the nuchal segment. The glabella is 2.75 mm. long, and 2.50 mm. wide at the back.

Comparisons.—If specimens were found without the palpebral lobes, it would be very difficult to distinguish them from *Leiostegium quadratum* (Billings). The cranidium is a little more convex, and perhaps more nearly square, but except for the size of the eyes, there is little difference between the two trilobites.

Horizon and locality.—A rather rare fossil in the Georgia formation at its contact with the Highgate, 4.5 miles north of Highgate Center, Vermont.

Holotype, no. 1735 in the Museum of Comparative Zoölogy. A single cranidium was found in the Highgate at Highgate Center, Vermont.

Family PTYCHASPIDAE, nov.

Ptychaspis differs widely from the typical Dikelocephalus, almost the only feature common to the two genera being the presence in both of trans-glabellar furrows. Some species of Saukia, however, so much resemble certain ptychaspids, that it is a question whether the latter group should be considered as a subfamily of the Dikelocephalidae, or as a separate family. In view, however, of the prominence of the glabella, the small eyes, the turned-down brim and the short pygidium of the ptychaspids, it seems probable that they were not derived from Dikelocephalidae, and they may for the present be placed in another family.

Genus **Ptychaspis** Hall.

Ptychaspis HALL, 16th Rept. N. Y. State Cab. Nat. Hist., p. 170, 1863.

Hall proposed this genus for two species of Upper Cambrian trilobites, *Dikelocephalus miniscaensis* Owen and *Dikelocephalus granulosus* Owen. Neither was designated as the genotype, neither species has since been removed from the genus, nor has either been by anyone designated, so far as I can find, as the type. The two species differ considerably but not sufficiently to require a generic separation at the present time.

The glabella of *Ptychaspis miniscaensis* tapers forward, has a furrow and convex border in front of it, and the small eyes are but slightly in advance of the middle. *Ptychaspis granulosa* on the other hand has a cylindrical glabella which is crossed by two deep furrows and the eyes are opposite the middle of the frontal lobe of the glabella. The glabella is, moreover, so long that it overhangs the anterior border.

Hall must have had some reason for placing *Ptychaspis miniscaensis* ahead of *Ptychaspis granulosa* in the descriptions but it is obvious that he had the latter species chiefly in mind when in the generic description he says, "Glabella *cylindrical, convex*, deeply

lobed or transversely furrowed, *very prominent in front. Eyes anterior to the middle.*" The portions italicized do not apply strictly to *Ptychaspis miniscaensis.* I propose, therefore, to select *Ptychaspis granulosa* Hall as the genotype of Ptychaspis. The *Ptychaspis granulosa* Hall is not, however, the *Dikelocephalus granulosus* of Owen, but an entirely distinct species, to which Whitfield gave the specific name of *striata. Ptychaspis striata* Whitfield is therefore the name of the genotype.

Ptychaspis striata Whitfield.

Ptychaspis granulosa HALL, 16th Rept. N. Y. State Cab. Nat. Hist., p. 173, pl. 6, figs. 33, 34, 35, 37, 40, and perhaps 36 and 39, 1863.

Ptychaspis striata WHITFIELD, Ann. Rept. Geol. Surv. Wisconsin for 1877, p. 55, 1878; *ibidem*, Rept. for 1879, p. 51; Geol. Wisconsin, vol. 4, p. 186, 1882.

Whitfield never gave any detailed description of his species, but merely applied the name to those specimens which Hall had identified as Owen's *Dikelocephalus granulosus.* Owen's original description of the latter species was exceedingly brief, and his figures very poor. The identification rests almost wholly upon the pustulose nature of the ornamentation. It is quite obvious that the specimen shown by Hall as figure 33 on plate 6 does not have a pustulose but a strongly striated surface. That shown in figure 34 is not ornamented at all but Hall explained that this was the cast of an interior whereas the other was a mold of the exterior of a cranidium. In general appearance the two are certainly much alike. It still remains a question, however, whether all of Hall's specimens belong to one species, and it would seem best to designate one of them, that represented as figure 33 on plate 6, as the type of *Ptychaspis striata.*

So far as I can determine, from what appear to be fairly typical specimens in the Museum of Comparative Zoölogy, the eyes are much farther forward in *Ptychaspis striata* than in either *Ptychaspis granulosa* (Owen) or *Ptychaspis miniscaensis* (Owen).

Ptychaspis affinis, sp. nov.

Pl. 14, fig. 6.

Description.—Cranidium very similar to that of *Ptychaspis granulosa* (Owen) as exhibited by specimens from the Franconia

in St. Croix Co., Wisconsin. Glabella oblong, prominent, but not elevated greatly above the fixed cheeks. The first glabellar furrows are indentations at the sides at about the middle of the length. They are short, turn slightly backward, and their inner ends do not meet. The second pair unite to produce one deep furrow which extends across the posterior portion of the glabella close to the occipital furrow and nearly parallel to it. The circum-glabellar furrow is narrow but deep, the fixed cheeks rising as an engirdling ridge, which, however, is turned downward at the front. The palpebral lobes are small, situated opposite the first glabellar furrows, and at about the middle of the cranidium. The test is mostly chipped off the type, but the glabella appears to have been granulose.

Measurements.—Length of cranidium of holotype 8 mm., width at palpebral lobes 9 mm., at posterior margin 14 mm.; length of glabella and neck-ring 6.5 mm.; width of glabella at back 5 mm., at front 4.25 mm.

Comparisons.—This species is much like *Ptychaspis granulosa* (Owen) in general configuration, but although the surface may have been somewhat granulose, it probably was not markedly so. The anterior glabellar furrows are much shorter than those of *Ptychaspis granulosa*, and the posterior ones deeper and have a course more nearly straight across the glabella. The eyes are farther back than those of *Ptychaspis striata* Whitfield, and there is no indication of the striated surface. *Ptychaspis minuta* Whitfield does not show continuous posterior glabellar furrows.

Horizon and locality.—A rare fossil in zone 3 of the Milton at Highgate Falls, Vermont. Type in the Yale University Museum.

Genus **Keithia**, nov.

One of the common fossils at Highgate Falls is a small trilobite which has a marked resemblance to Ptychaspis, but which is characterized by a large glabella which expands forward, has three instead of two pairs of glabellar furrows, no pair of which entirely cross the axial lobe. The posterior furrows almost unite, however, and the cheeks rise from the circum-glabellar furrow and then slope abruptly downward at the sides as in Ptychaspis, to which the genus is probably most closely allied.

Genotype, *Keithia schucherti*, sp. nov. Named for Arthur Keith who discovered the locality at Highgate Falls, as well as many others, in the course of his fruitful survey of northwestern Vermont.

Keithia schucherti, sp. nov.

Pl. 14, figs. 5, 9.

Description.—Cranidium narrow, about two-thirds as long as wide, the prominent glabella extending quite to the front, and overhanging the narrow convex border. The glabella is large, convex, expands forward, becoming increasingly convex to the middle of the frontal lobe, which has a very steep convex anterior slope. Three pairs of glabellar furrows are present. The first are narrow and shallow and merely indent the sides of the anterior portion of the glabella. The inner ends turn slightly forward. The second pair are wider and deeper, extending farther up the sides of the glabella, and their inner ends turn slightly backward. The last two furrows are the deepest and are long enough so that on some specimens their inner ends are almost united. They turn backward and then pursue a course parallel to the occipital furrow, as in Ptychaspis, but fail to produce a continuous furrow across the lobe. The neck-ring is narrow, with a very small median pustule.

The circum-glabellar furrow is narrow and the fixed cheeks moderately convex, the outer portions sloping downward. The occipital lobes are narrow just behind the middle of the cranidium, and connected with the frontal lobe by eye-lines. The course of the facial suture is apparently the same as that of Ptychaspis.

Measurements.—The holotype (a cranidium) is 7 mm. long, 11 mm. wide at the posterior margin, and 10 mm. wide at the palpebral lobes. Most of the specimens are of about this size; a few are smaller.

Comparisons.—This species is very similar to *Arionellus subclavatus* Billings, but the latter has an oval glabella and very oblique posterior glabellar furrows. *Arionellus subclavatus* is certainly to be referred to the genus Keithia and known as *Keithia subclavata* (Billings). *Ptychaspis minuta* Whitfield has incomplete posterior glabellar furrows but the glabella narrows instead

of expanding forward, and the species is probably best left in Ptychaspis.

Horizon and locality.—This is perhaps the most common trilobite in zone 3 of the Milton at Highgate Falls, Vermont. I have not found it in collections from the lower horizons. Type in Yale University Museum.

Opisthoparia of Uncertain Systematic Position.

Genus **Ambonolium**, nov.

This name is proposed for a trilobite of quite undetermined relationship. It is known from six cranidia and eight pygidia, which are placed together because of their association in the fragments of limestone. Since there is no proof that they belong together, the cranidium is made the holotype of the species and the genus also is based upon it.

Cranidium dominated by the large glabella which spreads out behind the eyes. Glabellar and dorsal furrows absent, eyes large, in front of the middle. Anterior brim extremely narrow.

Genotype, *Ambonolium lioderma*, sp. nov.

Ambonolium lioderma, sp. nov.

Pl. 14, figs. 10, 14.

Description.—Cranidium composed chiefly of the glabella, which has in front of it a very short, upturned, lip-like border, and beside it, back of the palpebral lobes, small fixed cheeks. The eyes are large, in front of the middle, and the unfurrowed palpebral lobes form flat projections from the glabella. There are no dorsal or glabellar furrows, and the occipital furrow on the axial lobe is present only across the median portion, where it is narrow and faint. A shallow occipital furrow crosses the fixed cheeks.

The glabella is evenly convex and expands back of the eyes, so that its outer margin at the widest part is on a line with the outer edge of the palpebral lobe. At the posterior lateral angles there is a suggestion of a pair of basal lobes. Surface of cranidium smooth.

The pygidium, which in one specimen is directly associated with this cranidium, is wider than long, without concave margin, the

pleural lobes ribless except for the anterior half-ridge, the axial lobe long, extending quite to the posterior margin, narrow, with indistinct rings the entire length.

Measurements.—Length of cranidium 9 mm.; width at palpebral lobes 9 mm.; width of glabella back of eyes 9 mm. Pygidium, 7 mm. long, 11 mm. wide; axial lobe 3 mm. wide at the front.

Comparisons.—The cranidium of this species is more nearly comparable to that of *Lloydia bituberculata* than to any other trilobite I know. Both have large tapering glabellae, narrow anterior rim and a flattening of the sides of the posterior portion of the glabella. *Lloydia bituberculata*, however, has wider cheeks in front of the eyes, and very definite dorsal furrows. It may be that better specimens will show that *Bathyurus bituberculatus* should be transferred from Lloydia to Ambonolium.

Horizon and locality.—This species, as represented by pygidia, is rather common in zone 3 of the Milton at Highgate Falls, Vermont, and two specimens have been found in zone 2. Types in the Yale University Museum.

Genus **Gignopeltis**, nov.

Billings described, under the generic designation of Dolichometopus, three species which are known from pygidia only. It has not yet been possible to connect any cephalon or cranidium with any of these pygidia but since they are rather common fossils and obviously do not belong to Dolichometopus, it becomes necessary, if only as a matter of convenience, to assign them a generic name.

The pygidia are moderately convex, with a broad axial lobe which is not much elevated above the general surface, have ill-defined or no rings and ribs, and lack a concave border.

Dolichometopus ? *rarus* Billings may be selected as genotype.

Gignopeltis rara (Billings).

Dolichometopus ? *rarus* Billings, Pal. Foss. Canada, vol. 1, p. 352, fig. 338, 1865.

A pygidium from the Georgia formation appears to belong to this species. It is two-thirds as long as broad, the axial lobe extends five-eighths the length, and occupies about one-third the

breadth. It has four ill-defined rings, and there are three pairs of flat ribs, scarcely separated by narrow, shallow furrows. The groove behind the axial lobe is nearly straight.

This pygidium differs somewhat from *Gignopeltis rara* in having an extra pair of ribs, but they are so ill-defined as almost to escape notice. *Gignopeltis convexa* (Billings, 1865, p. 269, fig. 253) is closely allied, but appears to have furrowed ribs, and only one ring on the axial lobe, whereas *Gignopeltis gibberula* (Billings, 1865, p. 269, fig. 254) has only one pair of furrows and a much shorter axial lobe. *Gignopeltis truncata* (Whitfield, 1891, p. 37, p. 2, fig. 6–8) has the axial lobe exceedingly like that of the present species, except that it lacks rings.

Horizon and locality.—From the Georgia formation, 4.5 miles north of Highgate Center, Vermont. All of the known species of this genus are from the Beekmantown.

Genus **Leiostegium** Raymond.

Leiostegium puteatum, sp. nov.
Pl. 14, figs. 12, 13, 16, 19.

Description.—Cranidium gently convex, somewhat quadrangular in outline. Glabella elongate, nearly rectangular but gently rounded at the front. Dorsal furrows narrow, not deep, ending anteriorly in a pair of pits. In front of the glabella is a narrow furrow bordering an equally narrow upturned and striated rim. The fixed cheeks rise as a sort of roll from the dorsal furrows to about the same height as the top of the glabella. Palpebral lobes large, a little back of the middle, and well out from the dorsal furrows. Occipital furrow narrow and deeply impressed.

Measurements.—The holotype, a cranidium, is 13.5 mm. long, and about 17 mm. wide at the palpebral lobes. A smaller cranidium is 9.5 mm. long, and there is a very poorly preserved one which is about 27 mm. long.

Comparisons.—This species differs from *Leiostegium quadratum* in having a longer and narrower glabella and particularly in possessing a pair of deep pits at the anterior ends of the dorsal furrows. These pits, together with the shape of the glabella and brim, cause this cranidium so greatly to resemble that of Olen-

oides as to lead to danger of misidentifications. In the present species, however, eye-lines and a nuchal spine are absent.

Another, apparently closely allied trilobite is *Barrandia ? mccoyi* Walcott (1884, p. 96, pl. 12, fig. 5) a species which can probably also be transferred to Leiostegium. Pits are present at the ends of the dorsal furrows of this species, and it appears to differ from *Leiostegium puteatum* only in that the glabella expands forward.

Horizon and locality.—Several cranidia of this species were found in the lower part of the Highgate limestone at Highgate Center, Vermont, and one large but imperfect cranidium at another locality in the Highgate limestone two miles north of Highgate Center. *Leiostegium quadratum* occurs in the pebbles of the conglomerates at Lévis and in the Beekmantown at Philipsburg, Quebec. *Leiostegium mccoyi* (Walcott) was found in the lower part of the Pogonip limestone (a zone about equivalent to the base of the Beekmantown) in Nevada.

Leiostegium cingulosum, sp. nov.

Pl. 14, figs. 18, 21.

Description.—The cranidium of this species is very like that of *Leiostegium puteatum*, but the anterior end of the glabella has a more rounded outline, and there are two pits on either side, one at the junction of each dorsal with the intra-marginal furrow, and another just behind it in the dorsal furrow.

Associated pygidium semicircular, strongly convex, without concave border. Axial lobe strongly convex, less than one-third the total width, reaching nearly to the posterior margin. It bears five rings, the last two of which are indistinct. Except for the anterior half-rib, which is distinctly marked, the pleural lobes are ribless, and slope steeply. The specimen is exfoliated, showing a narrow doublure, which leaves a narrow flat margin on the cast.

Measurements.—Length of cranidium 13 mm.; width of glabella at front 8.5 mm., at back about 8.5 mm. (damaged). Length of pygidium 10.5 mm., width 20 mm.; length of axial lobe 8.5 mm., width at front 5 mm.

Comparisons.—The glabella is much less quadrate than that of *Leiostegium quadratum* (Billings), and the rim is flatter. The

pygidium is relatively wider and its axial lobe is more prominent and more distinctly ringed.

Horizon and locality.—Found in the lower part of the Highgate formation 1.5 miles north of Highgate Center, Vermont. The pygidium is designated as the holotype and the cranidium as the paratype.

Order PROPARIA Beecher.

Family CHEIRURIDAE Salter.

Subfamily *Cheirurinae* Raymond.

Genus **Pilekia** Barton.

This genus has for its type *Cheirurus apollo* Billings, and includes species with a cephalon like Cyrtometopus and a somewhat elongate, spinose pygidium which suggests Pliomera, but is different in that each rib has a median longitudinal furrow, instead of a rib. *Pilekia apollo* has a somewhat rapidly tapering glabella, but *Pilekia foreolata* (Angelin) with the same sort of pygidium, has a long, narrow glabella.

Pilekia extenuata, sp. nov.

Pl. 14, figs. 17, 20.

Description.—All of the specimens—five cranidia and one pygidium—are either distorted or imperfect, so that the exact shape of the cephalon cannot be learned. The glabella is elongate, reaching nearly to the anterior margin, bounded by a very narrow furrow and lip-like rim. It is nearly parallel-sided, gently convex, rounded in front when not distorted. There are three pairs of diagonally directed glabellar furrows, the last the longest and most deeply impressed. The first pair are close to the anterior end, so that the frontal lobe is short. Fixed cheeks wide back of the eyes, with genal spines extended straight backward, but narrow in front of them. The palpebral lobes are small, situated far forward and rather close to the glabella. They are connected by a well-defined ocular ridge with the middle of the frontal lobe. Occipital furrow narrow but deep; nuchal segment narrow. The entire surface is covered with small granules.

Pygidium moderately convex, with four pairs of long marginal spines and vestiges of two more pairs in the middle at the posterior end. Axial lobe long and prominent, with five strongly defined

rings and a triangular terminal boss. Pleural lobes composed of furrowed segments, four pairs of which end in curved spines. The furrows are wide and medially placed, and there are narrower furrows between adjacent segments, so that each pleural lobe appears to be covered with narrow radiating ridges. Surface granulose.

Measurements.—Length of an undistorted cranidium (holotype) 11 mm.; width at base of glabella 7 mm., at outer ends of anterior glabellar furrows 6 mm. A large cranidium is about 18 mm. long. Pygidium 7 mm. long, and about 12 mm. wide at the front, excluding spines.

Comparisons.—The only other American species of this genus is *Pilekia apollo* (Billings), a trilobite which has been found in the conglomerates at Lévis only. It differs very much from that species, having a longer and narrower glabella which does not taper rapidly forward. The pygidia are of the same type, but that of *Pilekia apollo* has very narrow pleural furrows instead of wide ones, and shows only traces of spines back of the axial lobe.

Pilekia foveolata (Angelin) (1854, pl. 39, fig. 8; Broegger, 1882, pl. 2, fig. 5) is apparently a still more closely allied form, but has deeper glabellar furrows, and, if the figure is correct, wider fixed cheeks in front of the eyes.

Pilekia speciosa (Dalman) and *Pilekia primigena* (Angelin) (Moberg and Segerberg, 1906, pl. 7, fig. 12–16) have cranidia very like that of the species here described, but the pygidium of the first appears to lack pleural furrows, and that of the second has five pairs of long marginal spines. All of these species belong to the Euloma-Niobe fauna, and suggest that *Pilekia extenuata* may be of about the same age.

Horizon and locality.—Five of the specimens are from the Highgate limestone at a locality 2 miles north of Highgate Center, Vermont. One imperfect cranidium is from the same limestone at another locality 1.5 miles north of Highgate Center.

Pilekia eryx (Billings).

Cheirurus eryx Billings, Canadian Nat. and Geol., vol. 5, p. 322, fig. 30, 1860; Geol. Canada, p. 239, fig. 276, 1863; Pal. Foss. Canada, vol. 1, p. 413, fig. 399, 1865.

A single cranidium from the base of the Georgia formation 4.5 miles north of Highgate Center, Vermont, is referred to this

species. It retains the glabella, part of one, and all of the other fixed cheek. The glabella is compressed, but tapers somewhat forward, has a very narrow rim separated from the glabella by a linear furrow, and three pairs of deeply incised glabellar furrows. The eye is situated opposite the middle of the glabella, and is connected with it by an ocular ridge. The genal spines are short, but longer than shown in Billings' figure.

Although the eye is rather farther back than in most species of the genus, excepting, however, *Pilekia primigena* (Angelin), there is little doubt but that it is a close relative of the cheirurids which are found in the Ceratopyge zone of Sweden.

Summary and Correlation of Formations.

Milton Formation.

The upper portion of the Milton formation as exposed in the gorge at Highgate Falls, Vermont, consists of thinly bedded limestone, and glomeratic strata, made up of angular and rounded fragments of limestone in a calcareous matrix. Fossils have been collected at four horizons distributed through an interval of about 100 feet. Those from the uppermost zone, above the thickest conglomerate, are so few that they are not listed here, and those of the second and third zone, which are from layers separated by only a few feet of strata, are listed together. The strata of the "lowest zone" are some seventy feet below those of the "main zone."

Lowest zone.

Pseudosalteria laevis Raymond
Asaphiscus inornatus Raymond
Plethopeltis lata Raymond
Acheilus macrops Raymond
Apatokephaloides clivosus Raymond
Dikelocephalus insolitus Raymond
Richardsonella iole (Walcott)

Main zone.

Agnostus innocens Clark
Agnostus trisectus Salter
Agnostus insuetus Raymond
Pseudagnostus extumidus Raymond
Peronopsis planulata Raymond
Phalacroma parilis (Hall)
Phalacroma cyclostigma Raymond
Plethopeltis lata Raymond
Plethopeltis convergens Raymond
Stenopilus pronus Raymond
Stenopilus brevis Raymond
Corynexochus juvenis Raymond
Acheilus macrops Raymond
Acheilus spicatus Raymond

Idiomesus tantillus Raymond
Phorcotropis puteatus Raymond
Phorcotropis transversus Raymond
Zacompsus clarki Raymond
Onchonotus nasutus (Walcott)
Phylacterus saylesi Raymond
Phylacterus fraternus Raymond
Blountia imitator Raymond
Marysvillia triangularis Raymond
Lloydia seelyi (Walcott)
Plethopeltis armata (Billings)
Plethopeltis laevis Raymond
Plethopeltis angusta Raymond
Apatokephaloides clivosus Raymond
Apatokephaloides inflatus Raymond
Saukia lodensis (Whitfield)
Saukia stosei (Walcott)
Saukia dunbari Raymond
Richardsonella germana Raymond
Hungaia minuta Raymond
Illaenurus quadratus Hall
Illaenurus breviceps Raymond
Illaenurus laevis Raymond
Platycolpus dubius (Billings)
Ptychaspis affinis Raymond
Keithia schucherti Raymond
Ambonolium lioderma Raymond

Three of the seven species identified in the lower zone are found also in the upper one. Asaphiscus is normally a Middle Cambrian genus belonging to the Pacific province, but as stated in the description of *Asaphiscus inornatus*, there is a possibility that better material may show this generic reference inaccurate. In other respects the fauna of the lower zone is of the same type as that found in the higher strata.

The fauna as a whole, although consisting largely of previously unknown species, is distinctly of the facies of the Upper Cambrian of interior North America, as indicated by the presence of Saukia, Dikelocephalus and Illaenurus, and the absence of any European animals except *Agnostus trisectus*.

If comparison be made with the faunas of the St. Croixan of the upper Mississippi Valley, one finds but few species common to the two regions, but such evidence as there is points to correlation with the upper part of the Upper Cambrian, that is, with the Franconia and St. Lawrence formations. The St. Lawrence formation contains the great development of species of Saukia and Dikelocephalus, and two of the species found at Highgate Falls, *Saukia lodensis* (Whitfield) and *Illaenurus quadratus* Hall, are characteristic of the St. Lawrence. The Franconia appears to be the principal horizon for Ptychaspis, and one of our agnostids, *Phalacroma parilis* (Hall), was described originally from that horizon.

There is also considerable similarity between the faunas of the Milton and the Saratogan formations of New York and New Jersey. Noteworthy is the abundance of Plethopeltis, and the

presence of Saukia, Richardsonella and Ptychaspis. *Lloydia scelyi* occurs in the Potsdam of New York as well as in the Milton. The fauna of the Milton is so much richer and more varied than that of the Saratogan as to suggest that the latter was derived from the former, but whether contemporaneously or after a lapse of time remains to be proved. The presence of Blountia and Maryvillia, two genera of the Upper Cambrian of eastern Tennessee, and of *Saukia stosei*, a trilobite of the Conococheague of Pennsylvania, shows connections along the Appalachians south of New Jersey.

It is not very surprising to find in the Milton a number of species identical with or closely allied to those found in the boulders in the conglomerates at Lévis, but it is a satisfaction to find these forms in place. *Agnostus innocens* Clark, *Onchonotus nasutus* (Walcott), *Plethopeltis armata* (Billings), *Plethopeltis angusta* Raymond, and *Platycolpus dubius* (Billings) are the species so far found at both localities. In addition, there are closely related species of Acheilus, Richardsonella, Hungaia, and Keithia.

The single European species, *Agnostus trisectus* Salter, is found in the upper part of the Upper Cambrian (Peltura zone) in Europe and on Cape Breton in America.

The weight of evidence, at the present time, seems to indicate that the thinly bedded, fossiliferous part of the Milton at Highgate Falls is to be referred to the upper part of the Upper Cambrian. There is, however, so much that is novel in the fauna that fuller knowledge may make a revision of this opinion necessary.

Highgate Formation.

The Highgate formation consists largely of shale, but in the lower portion layers of limestone an inch or two in thickness are interstratified with partings of shale. All of the known outcrops of this formation are in a region which is considerably compressed, so that a schistosity has been produced nearly at right angles to the bedding, making it exceedingly difficult to break the rock in such a way as to reveal the fossils. Curiously, such fossils as can be obtained show comparatively little distortion. The most prolific locality so far found is a small outcrop at the entrance of a pasture at the western edge of the village of Highgate Center.

Eight species of trilobites have been collected there. A list from all localities, so far as the species are now identified, is as follows:

Agnostus, sp. ind.
Hypagnostus, sp. ind.
Leptopilus deciivis Raymond
Cholopilus vermontanus Raymond
Leiostegium puteatum Raymond
Leiostegium cingulosum Raymond
Maryvillia, sp. ind.
Lloydia seelyi (Walcott)
Lloydia saffordi (Billings)
Hemigyraspis, sp. ind.
Pilekia extenuata Raymond

This fauna contains only one species found in the Milton, namely, *Lloydia seelyi*, although the presence of Maryvillia is suggestive of the Upper Cambrian. On the other hand, the most common species, *Leiostegium puteatum* and *Pilekia extenuata*, belong to genera which are characteristic of the Lower Ordovician, as does Hemigyraspis. The specimens of *Lloydia saffordi* are large and closely comparable to those found in the Beekmantown at Philipsburg, Quebec, and *Cholopilus vermontanus* as well as *Lloydia saffordi* occur in the next-higher formation, the Georgia.

So far as can be judged from the trilobites as known at the present writing, the Highgate would be termed Ordovician rather than Cambrian but would be placed about on the border between the two. Pilekia and Hemigyraspis are the only genera which belong to the Ceratopyge fauna.

Georgia Formation.

The Georgia formation is best exposed directly north of Highgate Center and within a mile or two of the Canadian border. Like the Highgate it consists chiefly of shale, but has some limestone in the lower portion. At one locality fossils are numerous, but badly preserved; at another, where the Georgia and Highgate are in contact, the fossils are well preserved, but the quantity of material to be had is very limited.

The following species have so far been determined, all from the lower part of the formation:

Agnostid, gen. et sp. ind.
Cholopilus vermontanus Raymond
Petigurus cybele (Billings)
Gignopeltis rara (Billings)
Hystricurus mammatus Raymond
Lloydia saffordi (Billings)
Lloydia, sp. ind.
Asaphellus obtectus Raymond
Asaphellus, sp. ind.
Pilekia eryx (Billings)
Pliomerops, sp. ind.

The presence of *Petigurus cybele*, *Gignopeltis rara*, *Lloydia saffordi*, and *Lloydia*, sp. ind., which is an undescribed species known at Philipsburg, Quebec, indicates that this is a Beekmantown fauna, but so little is known of the range of trilobites in the Beekmantown that it would not be safe to make a definite correlation with any particular division. The genera Asaphellus and Pilekia would indicate a horizon very low in the Lower Ordovician; there is nothing to indicate a correlation with any member near the top of the Beekmantown, nothing, at least, higher than the Fort Cassin.

The "Ozarkian" Question.

I have left to the last a consideration of whether any of the faunas of this region may be considered as Ozarkian. The moment is very inopportune for such a discussion, since it is understood that the first papers descriptive of Ozarkian fossils will appear in 1924, and this is written in November, 1923. Dr. Walcott (1923, p. 457–476) has recently summarized the stratigraphy of the Ozarkian, presenting the views of Dr. Ulrich and himself up to the end of 1922. In it he has given lists of fossils, many of them, however, merely manuscript names, which do not allow fruitful comparisons.

The Hoyt limestone (Saratogan) is referred to the Sarcecn, or lower division of the Ozarkian. I have pointed out above the similarities of the faunas of the Upper Milton and the Hoyt. No other eastern formation now referred to the Ozarkian is well enough known to invite comparison.

The St. Charles formation of Utah and Idaho contains, according to Walcott, a large fauna, and the succession appears to be somewhat comparable to that in Vermont. The trilobites in the highest zone are recorded as *Hystricurus*, sp. ind., *Blountia*, sp. ind., *Asaphus* ? sp. ind., and *Ptychostegium idahoensis*. From the fact that *Barrandia* ? *mccoyi* Walcott is in another list called Ptychostegium, I infer that name applies to trilobites much like those called Leiostegium in this paper. This little fauna, therefore, recalls that of the Georgia.

About 1200 feet lower down, near the base of the St. Charles, the fauna consists chiefly of trilobites, but unfortunately, largely of undescribed genera and species. There are, however, two

species of Saukia, suggesting the presence of a fauna somewhat like the Milton. Walcott states that this fauna "has a very strong Upper Cambrian character."

The Mons of Alberta represents the Ozarkian in that region, according to Walcott. Eighteen feet below the summit two species of Ptychostegium were found in a fauna composed mostly of Mollusca. Sixty feet lower, Megalaspis? and Maryvillia were encountered, and at the base of the section, about 1,400 feet lower, a small fauna with Ptychaspis, Saukia, and Blountia.

Apparently, in these regions the succession is broadly the same as that observed in northwestern Vermont, and it may be that the Milton, Highgate and Georgia would be placed by some in the Ozarkian. As has long been known, there is a rather gradual change from the Upper Cambrian through the Beekmantown, and I am in sympathy with the idea of connecting the two in one system. In this particular region, however, there is so marked a change between the faunas of the Milton and the Highgate that there need be no fear of confusing them, and it appears to be more than usually easy to draw a boundary between the Cambrian and the Ordovician.

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EXPLANATION OF PLATES.

PLATE 12.

Figs. 1, 5. *Agnostus innocens* Clark. × 4.
Figs. 2, 6. *Agnostus insuetus* Raymond. × 6.
Fig. 3. *Agnostus trisectus* Salter. × 4. The ornamentation of the cheeks is not shown.
Fig. 4. *Phalacroma cyclostigma* Raymond. × 4.
Fig. 7. *Pseudagnostus extumidus* Raymond. × 4.
Fig. 8. *Phalacroma parilis* (Hall). × 4.
Fig. 9. *Peronopsis planulata* Raymond. × 4.
Fig. 10. *Idiomesus tantillus* Raymond. × 4.
Fig. 11. *Pseudosalteria laevis* Raymond. × 4.
Fig. 12. *Phorcotropis puteatus* Raymond. × 4.
Fig. 13. *Zacompsus clarki* Raymond. × 4.
Fig. 14. *Phylacterus saylesi* Raymond. × 2.
Fig. 15. The same species. × 4.
Fig. 16. *Phorcotropis transversus* Raymond. × 4.
Fig. 17. *Hystricurus mammatus* Raymond. × 2.
Fig. 18. *Phylacterus saylesi* Raymond. The holotype. × 2.
Fig. 19. *Phylacterus fraternus* Raymond. × 2.
Figs. 20, 24. *Plethopeltis walcotti* Raymond. × 2.
Fig. 21. *Marywillia triangularis* Raymond. × 2.
Fig. 22. *Blountia imitator* Raymond. × 2.
Fig. 23. *Asaphiscus inornatus* Raymond. × 2.

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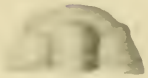

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PLATE 13.

Fig. 1. *Plethopeltis arenicola* Raymond. × 1.
Fig. 2. *Plethopeltis convergens* Raymond. × 1 1/3.
Fig. 3. *Plethopeltis laevis* Raymond. × 3 1/3.
Figs. 4, 8. *Plethopeltis angusta* Raymond. × 4.
Fig. 5. *Plethopeltis lata* Raymond. × 2 1/3.
Figs. 6, 7. *Stenopilus pronus* Raymond. × 1 1/3.
Fig. 9. *Stenopilus brevis* Raymond. × 3 1/3.
Fig. 10. *Corynexochus juvenis* Raymond. × 4.
Fig. 11. *Acheilus macrops* Raymond. × 4.
Fig. 12. *Acheilus spicatus* Raymond. × 4.
Figs. 13, 17. *Apatokephaloides clivosus* Raymond. × 2.
Fig. 14. *Asaphellus obtectus* Raymond. × 2.
Fig. 15. *Acheilus marcoui* Raymond. × 4.
Fig. 16. *Asaphellus*, sp. ind. From the Georgia, north of Highgate Center. × 1 1/3.
Fig. 18. *Asaphellus obtectus* Raymond the holotype. × 1.
Fig. 19. *Asaphellus*, sp. ind. From the Georgia, north of Highgate. × 1.
Fig. 20. *Leptopilus declivis* Raymond. × 3 1/3.
Fig. 21. *Saukia pepinensis* (Owen). × 2.
Fig. 22. *Dikelocephalus insolitus* Raymond. × 1.

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PLATE 14.

Fig. 1. *Hungaia minuta* Raymond. × 4 2/3.
Fig. 2. *Illaenurus breviceps* Raymond. × 2.
Fig. 3. *Richardsonella germana* Raymond. × 1 1/3.
Fig. 4. *Illaenurus laevis* Raymond. × 2.
Figs. 5, 9. *Keithia schucherti* Raymond. × 2.
Fig. 6. *Ptychaspis affinis* Raymond. × 1 1/3.
Fig. 7. *Saukia dunbari* Raymond. × 2.
Fig. 8. *Cholopilus vermontanus* Raymond. × 4.
Figs. 10, 14. *Ambonolium lioderma* Raymond. × 2.
Fig. 11. *Cholopilus vermontanus* Raymond. A free cheek. × 1 1/3.
Fig. 12. *Leiostegium puteatum* Raymond. × 1 1/3.
Figs. 13, 16. *Leiostegium puteatum* Raymond. A free cheek and a pygidium. × 1.
Fig. 15. *Cholopilus vermontanus* Raymond. × 2 1/3.
Fig. 17. *Pilekia extenuata* Raymond. × 1 1/3.
Figs. 18, 21. *Leiostegium cingulosum* Raymond. × 1 1/3.
Fig. 19. *Leiostegium puteatum* Raymond. A cranidium. × 2/3.
Fig. 20. *Pilekia extenuata* Raymond. × 2.

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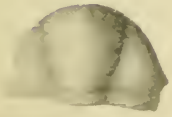
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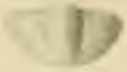
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